*Independent guide to the BBC MICRO!*

# THE MICRO USER

*Volume 2*
*Number 8*
*October 1984*
*£1.25*

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— Page 97

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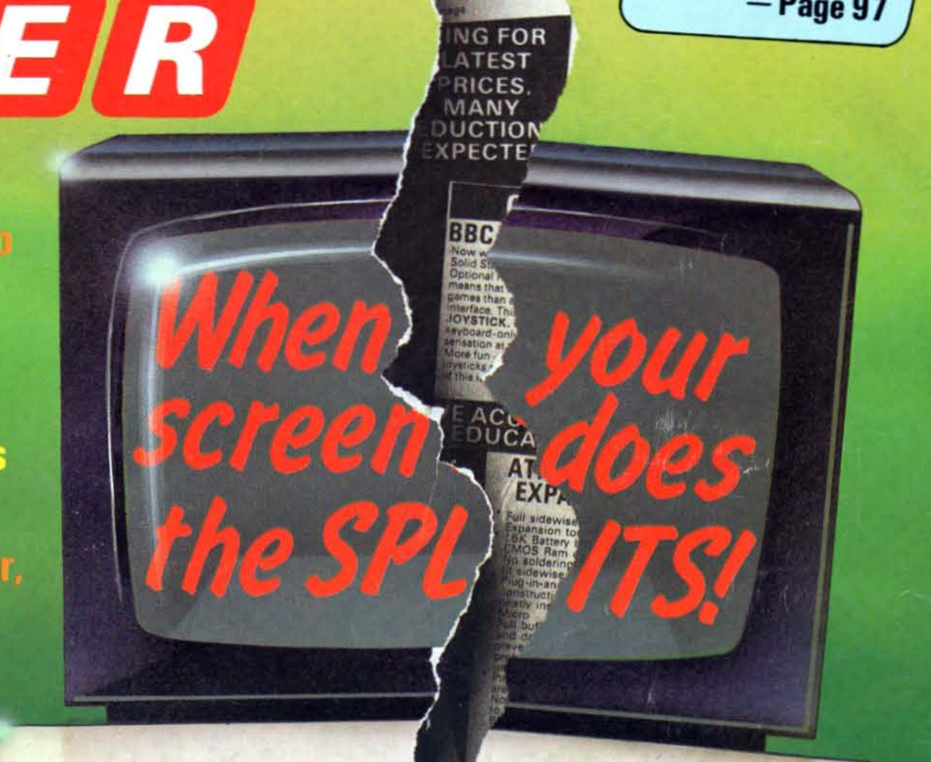
6809 2nd processor, Addcom reviewed

How to conjure up extra colours . . . write your own ROM software

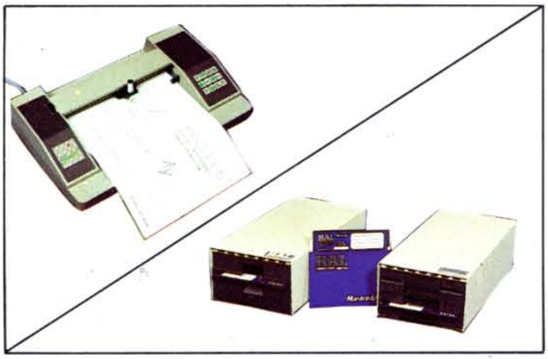


## When your screen does the SPLITS!

Seven Toolkit ROMs compared

Build your own digital to analogue converter — Page 199

# A Free Training Course with Every Plotter or Disc Drive



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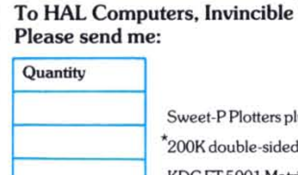

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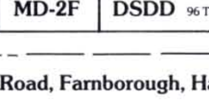

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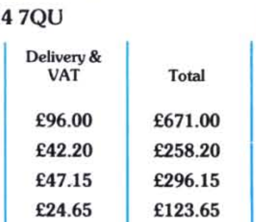

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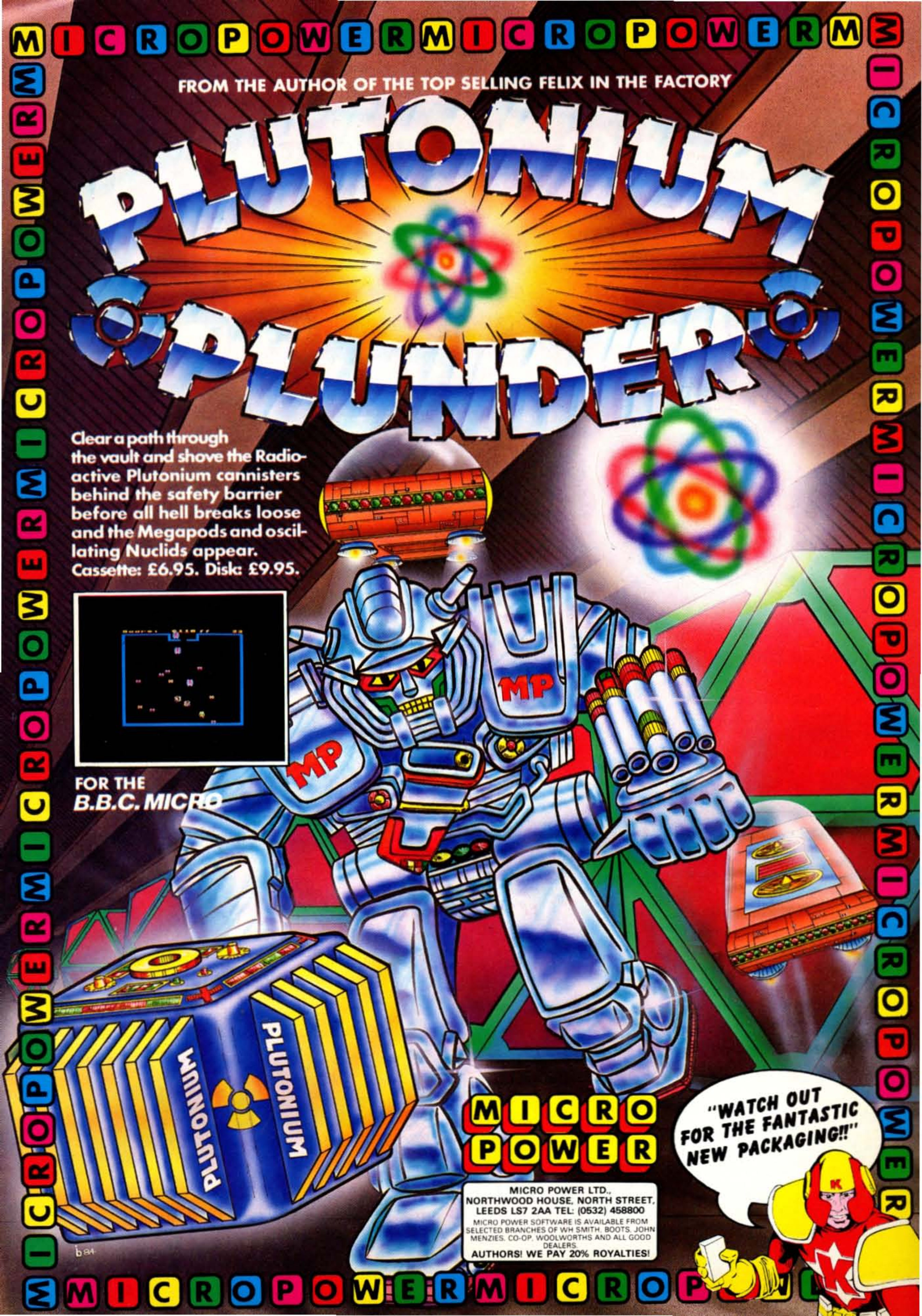
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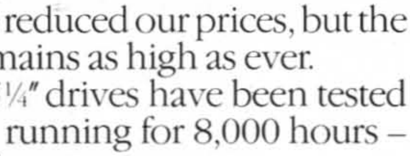

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5¼″ Discs – with full 5 year warranty and free library case.

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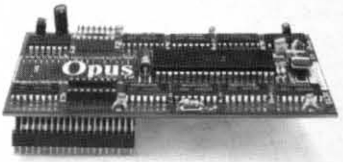
**DOUBLE DENSITY DISC INTERFACE.**



The ultimate double density disc interface for your BBC Micro, compatible with 6502 2nd Processor.

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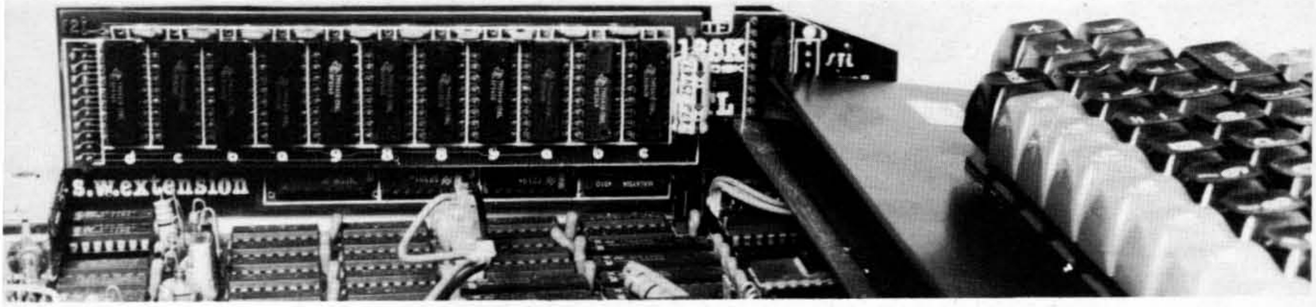
BU31

# SOLIDISK SIDEWAYS RAM: 8,000 UNITS SOLD



## **"Exciting"** (ACORN USER JAN 84), **"Power to your Beeb"** (PCN 61, MAY 84)

**HOW ABOUT COMPATIBILITY?**
The Sideways RAM is completely compatible with all issues of BBC computers, disks, all sideways ROMs, second processor, Torch disk pack, Teletext, Econet etc. but NOT with ROM extension boards, since it can replace them.

Its power consumption is so low that you can use it in conjunction with twin disks.

**HOW DOES IT WORK?**
Occupying the same place as sideways ROMs (such as BASIC, DFS, CPN etc), it is treated like other Sideways ROMs and therefore can replace them.
The Machine Operating System uses Sideways RAMs as naturally as Basic, without procedures or programming rules.
Sideways RAM can run any language, any filing system including Hi-Basic and second processor DFS.

**SIDEWAYS RAM POWER IS IN THE SOFTWARE:**
Different from Sideways ROMs, Sideways RAM can be written into. This property gives birth to a NEW GENERATION of software for the BBC computer: SERVICE RAMs and VIRTUAL MEMORY PROCESSOR.
Each SERVICE RAM has its own commands and code as its counterpart Sideways ROM but has its own private workspace and storage area thus leaving you with the lowest possible PAGE value (PAGE = &E00). On the other hand, the Virtual Memory Processor can run huge MACRO BASIC programs (Megabytes are not the limit), keep them on disk and uses the basic 32k of RAM as transient program area. All software for the Sideways RAM system is free.

**FREE SOFTWARE?**
Solidisk Sideways RAMs is bundled with lots and lots of software, FREE and we mean FREE, now and later. It is quite simple: for every Sideways RAM sold, £1 is spent on MORE software. Sideways RAM users are invited to spot new applications and contributions are rewarded at the usual rate of £1 for every 4 bytes of machine code.
The result is printed on the opposite page.

**HOW ABOUT THE FUTURE?**
Solidisk Sideways RAM is also widely used in schools for ECONET stations, by professional programmers for writing programs, research laboratories for RAM disk data base, at home for wordprocessing and now even games.
New areas are being developed: Telesoft and Teletext logging, Speech Processor assembler and Relational Data base to cite a few.
As the price of 16k EPROMs are as high as £20 at the present time, more Sideways ROM software publishers will be willing to sell their software on disk. Solidisk will mail FREE OF ANY COST their advertisement to ALL Sideways RAM users providing the price of the Disk version reflects savings in the cost of the ROMs. Solidisk believes that the majority of BBC users will have their Sideways RAM fitted before the end of next year.
Also unlike other makes (SIR, APTL, WE Sideways ROM/RAM extension boards and the Aries B20), Solidisk Sideways RAM is expandable from 16k right to 128k and now to 208K.
As a result of VLSI technology and volume of sales, Solidisk products also have a lower shop price than any other products.

**OTHER PRODUCTS FROM SOLIDISK:**
UVIPAC EPROM ERASER:
Uvipac is powered by the mains, simple to operate and can erase 3 Eproms of any type in just 15 minutes. Uvipac is ideal for home use.

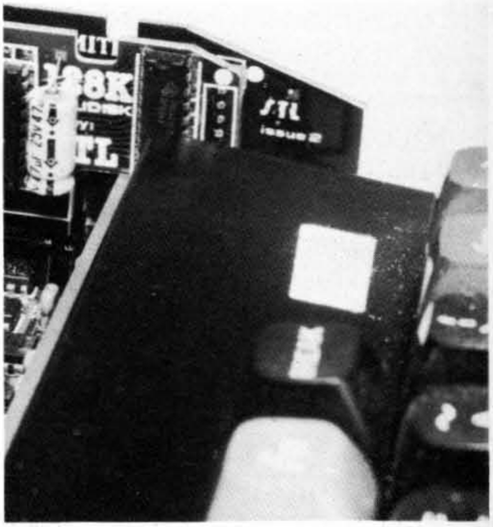
DETACHABLE KEYBOARD CASE:
Remove the keyboard from the BBC computer and instal it in the new case. Replace the old 3" keyboard tail by the new 24" cable and you can work really in comfort even for very long hours. The keyboard case is more a productivity tool than just ergonomics.

CPU CASE:
Replace the top of the BBC computer case by this metal CPU case. Sit your monitor on top (it is tough enough to take even your weight!). The CPU case has 2 compartments for half height 5.25" disk drives with fixing screws, air vents and provision for a bolt-on fan. At first sight, there is no trailing wire. Looking inside, there is enough room to accomodate Teletext Adapter, Second Processor, Solidisk and a fan!

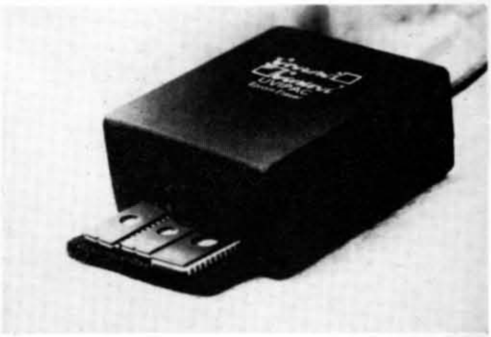
DOUBLE DENSITY DISK INTERFACE:
2 versions of this double density interface will be available: as direct replacement for the Acorn Disk Interface (Version A) and as a Second Disk Interface (Version B) adding to your existing interface. They all use the same Western Digital controller chip (WD1770).
Price £39.95 inclusive

DISK DRIVES:
3 models are being offered:
STL55A: 40 tracks single sided, SLT55F: 2 x 80 tracks, double sided and the best of mini floppy technology STL320: 2 x 160 tracks, double sided.
All disk drives are supplied with cables, formatter disk, head cleaning kit and 2 year warranty.

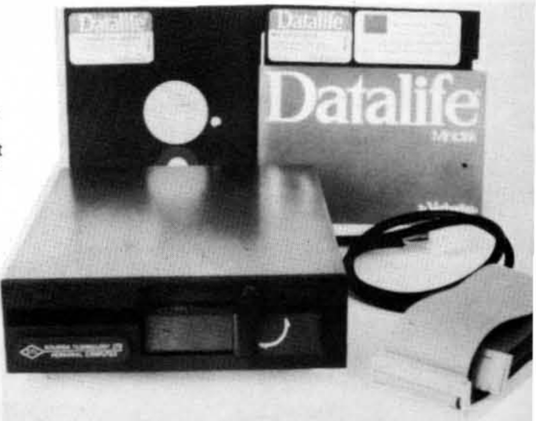
## **"Break the Ram Barrier"** (A&B)



UVIPAC EPROM ERASER



TEAC DISC DRIVES FD55 Series



# WHICH SIDEWAYS RAM DO YOU NEED?

Solidisk Sideways RAM is available in 16l (SWR16), equivalent to 1 sideways ROM, 32k (SWR32), equivalent to 2 sideways ROMs, 128k (Solidisk), equivalent to 8 sideways ROMs and the 208k Solidisk equivalent to 12 Sideways ROMs. You can buy a small Sideways RAM now and upgrade it later. From the SWR16 to the SWR32 is by straight exchange, from the SWR32 to the Solidisk is by adding the 96k Solidisk Extension, from 128k to 208k is by exchange of the RAM card.

**FREE SOLIDISK SOFTWARE:**

WORD64:
WORD 64 is a Service RAM, it uses Solidisk as storage for WORDWISE, up to 64K free characters for any text.

SILEXICON:
SILEXICON is a Spelling Checker for Solidisk. SILEX scans texts at more than a 1,000 words a minute and compares each word against the dictionary, Silexicon marks the mis-spelt words for either addition to the dictionary or eventual correction.

PRINTER BUFFER:
PRINTER BUFFER is a Service RAM, it increases 500 times the normal 32 bytes printer queue to 15K bytes, completely transparent to the user. PRINTER BUFFER is as useful for printing a long document as for a short program listing.

STLEOO:
STLOO is a Service RAM, it is Disk Filing System that leaves PAGE at &EOO, has built-in disk formatter/verifier and automatic track stepping for 40/80 track disk drives.

STL150:
STL150 is a Service RAM to enhance Acorn's .90 DFS to offer up to 150 directory entries per side.

STL-RFS:
STL-RFS (RAM/ROM filing system) is a Service RAM and an innovation in portable applications. STL RFS saves any program in a Sideways ROM format, it can then be copied onto EPROM to give instant recall of your programs. Plug this EPROM into any sideways socket, type *RFS and it runs itself. Compatible with the ELECTRON and BBC, tape and disks, SWR16, SWR32 and Solidisk.

INDEX:
INDEX is a Service RAM, it stores all the entry points of one or several sequential data files such as mailing list, stock list, accounts etc, merges, sorts them in alphabetical order and gives instant access to any record. INDEX can handle 1,100 records of any size, any type, any number of fields.

MACRO-BASIC:
MACRO-BASIC is a program generator. You use a wordprocessor to create a command file which is then scanned by MACRO. MACRO uses other programs, subroutine libraries, text files (actually any or all files on your disks) as source to generate a bug free BASIC program which can be very large (Megabytes are not the limit).

VIRTUAL MEMORY PROCESSOR:
VIRTUAL MEMORY PROCESSOR (VMP) uses extensively overlay technique and Solidisk as back store for very large programs that cannot be run otherwise. VMP uses the 32k basic RAM as transient area: it operates on a Main Program as generated by MACRO-BASIC, taking different segments from the Solidisk Store, POOL, HOLD, FREE or CLEAR segments from the transient area. For example: VMP will accept 20 segments of 10k of Basic assembler and assembles it into 16k of machine code.

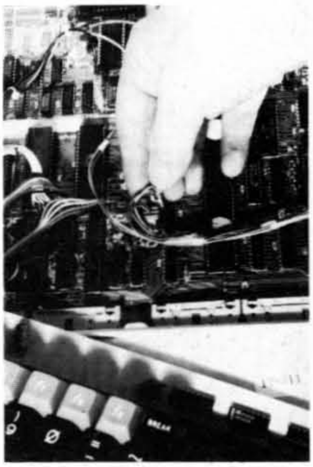
MENU:
MENU puts all computer's resources at your fingertips. MENU displays your Sideways Firmare, Disk Directories, Sideways RAM system, Solidisk System etc.

**MORE FREE SIDEWAYS RAM SOFTWARE TO COME:**
While others are making promises for software to be written, Solidisk Systems RAM comes with a complete, novel and powerful software package including compatibility with existing sideways software.
Each Sideways RAM is accompanied by the Sideways RAM User Manual, full 1 year warranty, 1 utility disc* and free mailing on all new publications from the Software Support Service.

*It should be understood that we cannot put as much free software on a 40 track single sided as on a 80 tracks. The present software package require 160 tracks of storage and can be accommodated on ONE 2 X 80 track double sided diskette, only the most useful programs are supplied on other formats (ie 40 track single sided, 2 X 40 track double sided, 80 track single sided). Should you require the whole collection of free software, please place an order for extra disks.
For the technical minded: the Source Code and Technical Manual (3 floppies and a 300 + page book) price = £10, the SILEXICON EXTENSION PACKAGE (3 floppies and a 40 page mnual, 30,000 word dictionary: English and French now, German and Spanish planned) price = £9.00. '4S' also publishes regular updated SWR utility discs at £3.00.
Every user can do contract work for the SUPPORT SERVICE and make a lot of money for him/herself!

HOW EASY TO INSTALL:

Push in the base unit


Connect the control wires

**PRICE LIST** (including VAT and post & packing)

| | |
|---|---|
| SIDEWAYS RAM: | |
| SWR 16K | £43.65 |
| SWR 32K | £59.95 |
| 128K SOLIDISK | £150.95 |
| 208K SOLIDISK | £243.00 |
| The following are upgrade prices for existing Sideways Ram owners: | |
| 16 – 32 (please return complete item) | £18.00 |
| 16 – SOLIDISK (please return complete item) | £109.00 |
| 32 – SOLIDISK (no return necessary) | £93.00 |
| 128K – 208K SOLIDISK | £93.00 |
| DISK DRIVES: | |
| STL55A (40 track, single sided, cased with cables, diskette, manual and 2 years warranty) | £142.95 |
| STL55F (2 X 80 track, double sided, as above) | £232.95 |
| STL320 (2 X 160 tracks, double sided, as above) | £499.00 |
| FLOPPY DISKS (DATALIFE Verbatim): | |
| MD525 (SS/DD 40 or 80 track) box of 10 | £16.00 |
| MD550 (DS/DD 40 or 80 track) box of 10 | £22.00 |
| MD557 (DS/DD 98 TPJ) box of 10 | £27.00 |
| CPU CASE | £13.00 |
| DETACHABLE KEYBOARD CASE | £27.99 |
| EPROM PROGRAMMER (used with Sideways Ram) | £16.00 |
| UVIPAC EPROM ERASER (free standing unit) | £20.95 |
| 2764 PACK OF 5 | £36.00 |
| SOURCE CODE + TECHNICAL MANUAL | £10.00 |
| SLEXICON EXTENSION PCKAGE | £9.00 |

**WE STOCK A LARGE RANGE OF PRINTERS AND MONITORS. CALL OUR SALES OFFICE FOR IMMEDIATE QUOTATION.**

**HOW TO ORDER?**
You can order any item using the coupon. Post and packing is only charged once.
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Educational authorities, Acorn dealers and OEMs can obtain quantity discounts.

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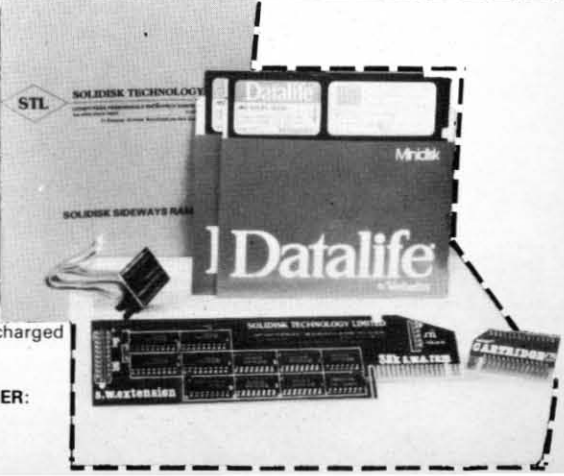
Credit Card Account:

Callers are requested to ring first for appointment.

Total: £

If ordering more than one item, deduct £1 per item as post and packing cost is only charged once.



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Professional users of the IBM PC, DEC Rainbow and ACT Apricot and Sirius are already aware of the advantages of Quest's Firefly Winchester Disks in capacities of from 7.5 to 115 Mbytes, and now one of the Firefly family, the Firefly B, is available to users of the BBC micro.

As specialists in the production and distribution of Winchester disks, Quest have been able to negotiate the keenest possible price for the Firefly B and now offer it's benefits to all BBC users.

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High recommendation indeed from Personal Computer News. Meanwhile Acorn User said:

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BU29

## B-BASE: £25—8 Great Features

WHAT IS A DATABASE?

It is a FILE which contains RECORDS. Records consist of a number of FIELDS containing the information—an analogy can be drawn with a card index in which a box of cards is the file. Each card is a record and each line on the card is a field.

SPECIFICATION

1) Random Access—disc based, single or dual drives
2) File Size—99K (40 track), 199K (80 track) —65,000 + records
3) Record Size—up to 2048 characters and 200 fields
4) Field Size—up to 254 characters with complete line scanning
5) Access any record using Primary Key in 2 seconds
6) Holds—1200 NAMES AND ADDRESS records on 100K disk
7) Search—500 records on 5 fields in 60 seconds
8) Sort—500 records on 3 fields in 60 seconds

SYSTEM FEATURES

SEARCH PARAMETERS = ,<, >, >= ,<= ,<>, INSTR
CALCULATE—Global or local totals and functions using any valid BBC expression
POWERFUL PRINTOUT OPTION—Eliminates need for separate mailing program, Parallel/Serial Printout allows setting of printer control codes, line spacing, tabulation, Headings etc. plus label printing with horizontal and vertical tab control.
REDEFINE—Titles, field widths, number of fields etc.
TRANSFER—Records from one file to another
SEARCH LISTS—Allow creation of sub-Databases within main Database but without having to save data again.
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All timings and sizes are relative to ACORN DFS. Compatible with ACORN DFS, WATFORD 1.3 and latest AMCOM DFS.

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## REPLICA II: £12.00.

The original REPLICA set a very high standard so the specification we set our chief programmer included some impossible features. In fact ACORN state that some of the things that we have done are impossible, it just took us longer that's all. REPLICA II transfers most cassette based programs to disk, even more than REPLICA. When you buy disk drives you do not have to throw away expensive cassette based programs.

REPLICA II transfers 'LOCKED' programs, programs loading as files, programs that load below &EOO, those with up to 6 sections and those up to &6E in length eg adventure programs. No waiting for 6 minutes whilst adventure programs load.

REPLICA II is very easy to use. The user enters a name, how many sections and whether CHAIN, *RUN or *LOAD to load the first section. Press play and let the program do the rest, even a menu.
Think how much it will cost you to buy just 1 disk version of your favourite program—REPLICA II which will hold up to 16 programs limited only by the disk capacity.

# CLARES No1 IN UTILITY SOFTWARE!

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## THE KEY: £12.95

The original disk utility program for the BBC that provides the user with the tools to explore the disk environment and use it to its best advantage. The programs are:

1) FORM40—Formats and verifies 40 track disks.
2) FORM80—Formats and verifies 80 track disks.
3) BACKUP—Allows backup copies of your valuable disk to be made.
4) EDITOR—Enables the user to read the disk sector by sector and to alter programs on the disk, even most protected and unlistable ones. More fun than any adventure game.
5) RETRIEVE—Allows the user to recover data or programs that have been accidentally erased or damaged by a head crash.

Every disk owner should have one. Recommended by: WHICH MICRO; EDUCATIONAL COMPUTING etc.

Available At Larger Boots

## JOYSTICK UTILITY: £6.00

Converts non joystick programs to work with joysticks. Works with any program using INKEY (-) in Basic or machine code, to detect movement, which applies to most programs. The routine is relocatable and sensitivity of the joystick can be varied. Compatible with most games, including Acornsoft. Very easy to use, just press the keys you want to transfer. The machine code can be saved as a block of just 100 bytes. Supplied on cassette but can be transferred to disk.

## SHADOW: £8.00

SHADOW is a tape cloning program that makes security copies of your valuable cassette software. SHADOW works with 99% of all known programs including those with sections at 300 BAUD and those that load as files. SHADOW will handle programs with any number of sections and it will work with any of the current operating systems including 0.1, 1.0 & 1.2 SHADOW is the definitive tape backup system and as a bonus you also get 'INSPECTOR' on the same tape. This allows you to view all areas of memory, search and alter bytes, etc. Colour coding helps to simplify memory usage.
"It is a condition of sale that this program is not used for piracy."

## JOYSTICKS: £17.95

BBC JOYSTICKS—Fully proportional joysticks in smart, sturdy injection moulded cases. 1.5 metres of cable, long life mechanism gives precise operation. British made.

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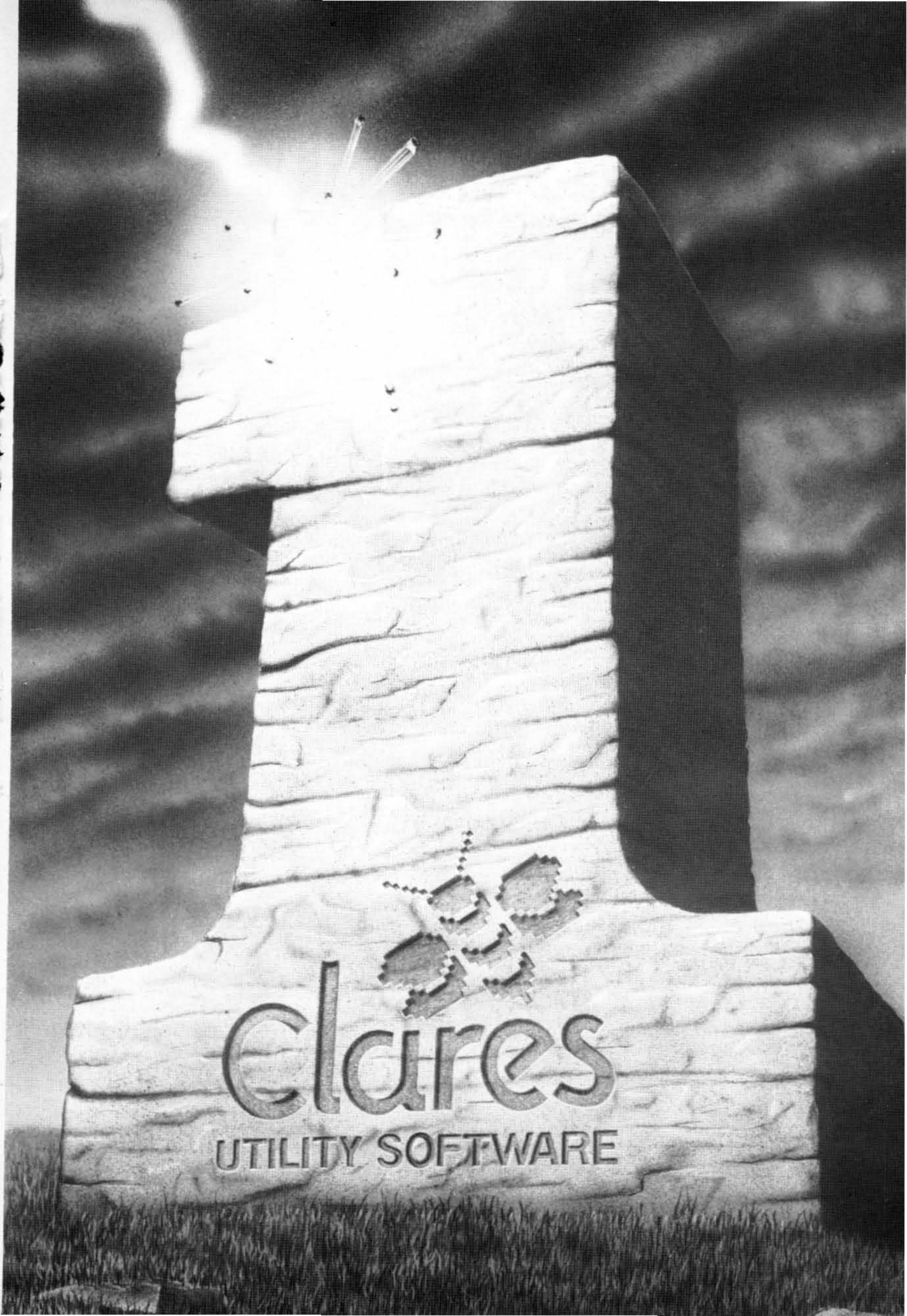
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UTILITY SOFTWARE

# OUR DOUBLE-SIDED 3" DISC DRIVE. A TRIPLE OFFER.

Opus have a triple offer of 3" disc drives for those who wish to improve their micros.

The disc drive is compatible with the BBC Micro, has a direct drive mechanism, is double-sided and comes with a comprehensive manual.

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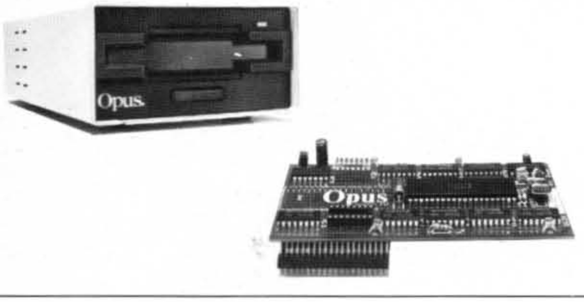
## 3" DISC DRIVE

You can buy this 500K (Unformatted) double-sided disc drive for the same price that other companies sell single drives for. The drive heads read and write to and from both sides of the disc cartridge, giving you twice the on-line capacity of single 3" drives.

**Normally ~~£229.95~~** **Now £199.95**

**SAVE £30**



## 3" DISC DRIVE AND DOUBLE DENSITY INTERFACE

If you currently run your program on a cassette recorder, you'll need to upgrade your micro in order to use a disc drive. This offer not only gives you an interface, but it effectively doubles the capabilities of the drive – giving you 350K of usable capacity instead of the 200K normally achievable.

**Normally ~~£359.95~~** **Now £299.95**

**SAVE £60**

## 3" DISC DRIVE AND 5¼" DISC DRIVE

Both drives come 'daisy-chained' (or linked) together. They're completely compatible and will allow you to down load all those programs you made on 5¼" floppy discs onto a robust 3" cartridge.

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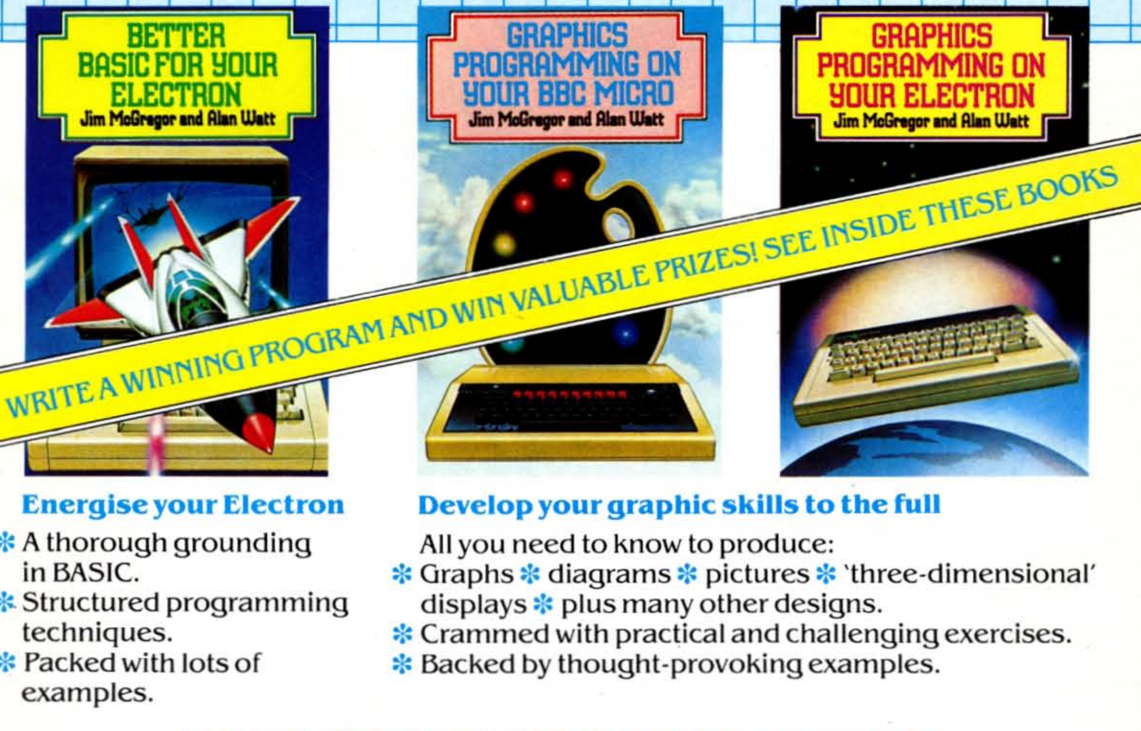
# STOP!

# IF YOU'RE AN ACORN USER, YOU NEED TO BUY THE BEST!



BETTER BASIC FOR YOUR ELECTRON
Jim McGregor and Alan Watt
GRAPHICS PROGRAMMING ON YOUR BBC MICRO
Jim McGregor and Alan Watt
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Jim McGregor and Alan Watt
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MAKE THE MOST OF YOUR MICRO – PUT YOURSELF IN THE PICTURE! WITH THREE NEW BOOKS BY JIM McGREGOR AND ALAN WATT, AUTHORS WHO STAND "HEAD AND SHOULDERS ABOVE THE REST." (MICRO USER)

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Ⓑ

# The Graduate.

## The first IBM PC compatible upgrade for the BBC model B micro.

# From only £764.00 the new Torch Graduate will upgrade your BBC Model B to a powerful 16 bit business computer

TECHNICAL SPECIFICATION

- 8088 16-bit processor running at 5 Mhz
- 128K or 256K RAM
- MS™-DOS operating system customised to IBM compatibility
- Model G400 – Single, double sided, high density disc drive (320K formatted)
- Model G800 – Twin, double sided, high density disc drives (640K formatted)
- Integral stabilised power supply
- 2 IBM PC compatible hardware expansion buses
- Software compatibility allows Lotus 1-2-3 and all popular IBM PC business programs to run without modification, subject to the constraints of the BBC keyboard and display
- Disc interface is not required

Keyboard text and graphics supplied by BBC Model B

**• THE GRADUATE •**

Disc and hardware compatible with the IBM PC, the Graduate is the latest addition to the Torch range of BBC upgrades. It's MS™-DOS operating system is customised to IBM compatibility allowing exploration of the massive range of IBM compatible business software, programming aids, compilers and languages universally available from most major software houses.

## Introduction to MS™-DOS

The Graduate offers two levels of upgrade, the G400 and the G800, both with 128K on board user memory as standard (optionally 256K). This can be increased to 1.2 Mbytes with an IBM compatible expansion board. The G400, contains a single, double sided 320K formatted disc drive and provides the low cost introduction to MS™ -DOS for the user who wants real 16 bit power from his Model B.

## More data storage

A step up from the G400 is the G800 which offers twin, double sided 320K disc drives for extra data storage. Both the G400 and the G800 provide the possibility of further expansion for networking, modems, etc., via the IBM compatible hardware slots provided by the Graduate models. Each model comes complete with a well written user/technical manual and connecting leads.

## Just plug it in

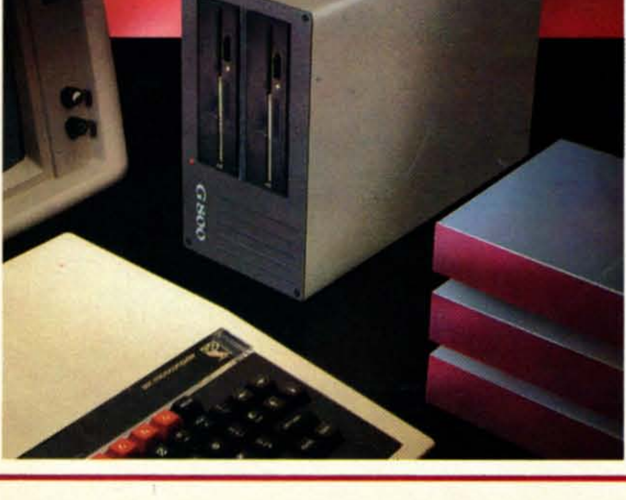
Unlike other add-ons there is no need to open the BBC to make the connection. The compact and tidy Graduate models simply plug in to the 1MgHz bus on the Model B. Within minutes you can be up and running with an IBM PC compatible system that really means business.

## The range

Add 256K RAM, 640K disc storage and IBM PC compatibility to the BBC Micro for less than £1,000.

| | |
|---|---|
| Graduate G400 (128K) | £764 inc.VAT |
| Graduate G400 (256K) | £815 inc.VAT |
| Graduate G800 (128K) | £949 inc.VAT |
| Graduate G800 (256K) | £999 inc.VAT |

For further information complete the coupon today.



**TORCH COMPUTERS**

Lighting the way ahead.

Torch Computers Limited
Abberley House, Great Shelford, Cambridge CB2 5LQ.
Telephone (0223) 841000. Telex 818841 TORCH G.

The Graduate is manufactured by Torch Computers under licence from Data Technologies Ltd.

To: Torch Computers Ltd., Abberley House, Great Shelford
Cambridge CB2 5LQ. Telephone (0223) 841000

Please send further information on the Graduate and the address of my nearest dealer.

Name ______________________

Address ______________________

______________________

______________________

Post Code ______________________

Telephone ______________________

MU10

# Introducing BEEBUGSOFT

Until recently a very special range of applications and utility packages for the BBC micro has been unavailable to the general public.

This software has been produced by the BBC user group BEEBUG for its members. BEEBUG members tend to be a demanding and discerning group of individuals; and the range of software produced has been kept to a consistently high standard through their constant vigilance.

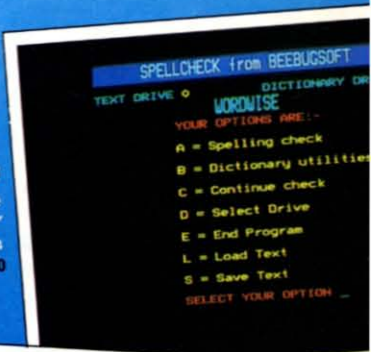
As a result, BEEBUG software is highly acclaimed amongst BEEBUG's 25,000 members. Independent reviews from the major computing magazines seem to take a similar view of the software, as you can see from their comments.

**SPELLCHECK**

The disc based spelling checker for text created on Wordwise or View.

*"...invaluable ... fast and reliable ... a worthwhile investment"*
PCN February 1984

**Disc £19.00**



```
SPELLCHECK from BEEBUGSOFT
TEXT DRIVE 0           DICTIONARY DR
             WORDWISE
         YOUR OPTIONS ARE:-
         A = Spelling check
         B = Dictionary utilities
         C = Continue check
         D = Select Drive
         E = End Program
         L = Load Text
         S = Save Text
          SELECT YOUR OPTION _
```

**TOOLKIT**

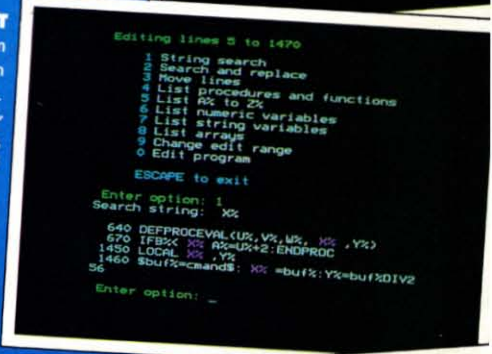
27 new commands in eprom to speed up Basic program development and debugging.

*"...an indispensible aid"*
EDUCATIONAL COMPUTING March 1984

*"...worth every penny ... highly recommended"*
COMPUTING TODAY June 1984

*"...its range of utilities is excellent"*
MICRONET May 1984

**Eprom £27.00**



```
Editing lines 5 to 1470

      1 String search
      2 Search and replace
      3 Move lines
      4 List procedures and functions
      5 List A% to Z%
      6 List numeric variables
      7 List string variables
      8 List arrays
      9 Change edit range
      0 Edit program

      ESCAPE to exit

 Enter option: 1
Search string:  X%

  640 DEFPROCEVAL(U%,V%,W%, X% ,Y%)
  670 IFB%< X% A%=U%+2:ENDPROC
 1450 LOCAL X% ,Y%
 1460 $buf%=cmand$: X% =buf%:Y%=buf%DIV2
56

 Enter option: _
```

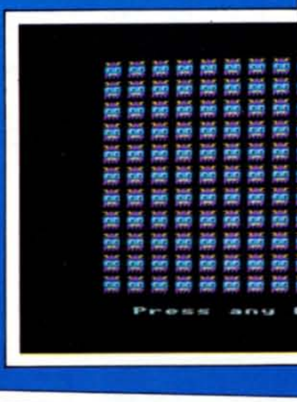
**SPRITE UTILITIES**

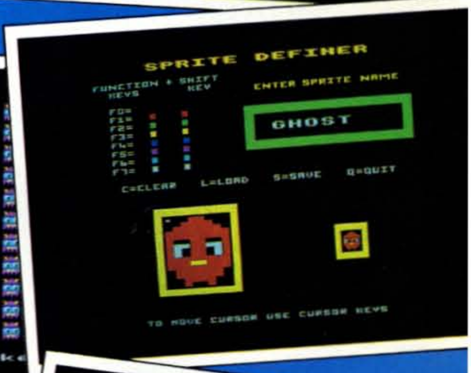
A game writers utility pack enabling high speed arcade games to be quickly written in Basic.

*"...definitely recommended ... excellent"*
ELECTRONICS AND COMPUTING May 1984

*"...Sprite Utilities wins through"*
ACORN USER May 1984

**Cassette £10.00**
**Disc £12.00**





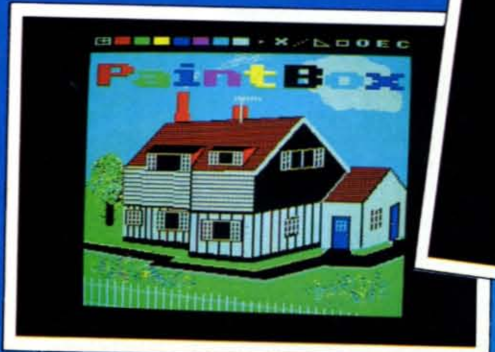
**PAINTBOX**

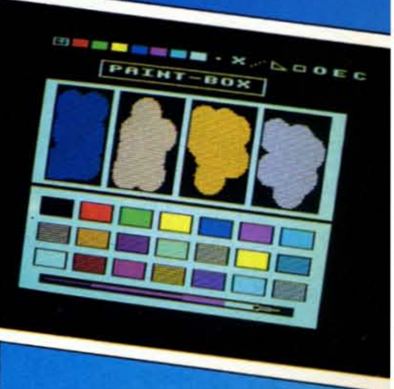
Probably the ultimate joystick drawing package on the BBC Micro, great fun and highly educational.

*"...amazingly versatile ... easy to use ... (one of the most feature laden picture creating programs around) ... tremendous potential"*
EDUCATIONAL COMPUTING Jan 1984

*"...a very sophisticated and versatile utility"*
ELECTRONICS AND COMPUTING May 1984

**Cassette £10.00**
**Disc £12.00**





HONEST JOE
USED CARS
HONEST JOE
Would you buy a used car from this man?

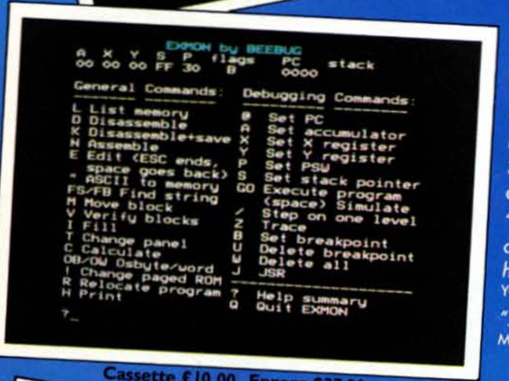
```
KONG
HIGH SCORES
1.  BEEBUGSOFT....5000
2.  BEEBUGSOFT....4000
3.  BEEBUGSOFT....3000
4.  BEEBUGSOFT....2000
.  BEEBUGSOFT....1000
ss Space-bar to Play
```

**TELETEXT PACK**
A powerful screen editor for quickly creating Teletext Mode 7 screens.

*". . provides teletext editing facilities in a well thought out manner"*
ELECTRONICS AND COMPUTING April 1984

*". . a very neat utility"*
MICRONET April 1984

**Cassette £10.00**
**Disc £12.00**


```
              EXMON by BEEBUG
A  X  Y  S  P  flags   PC    stack
00 00 00 FF 30   B     0000

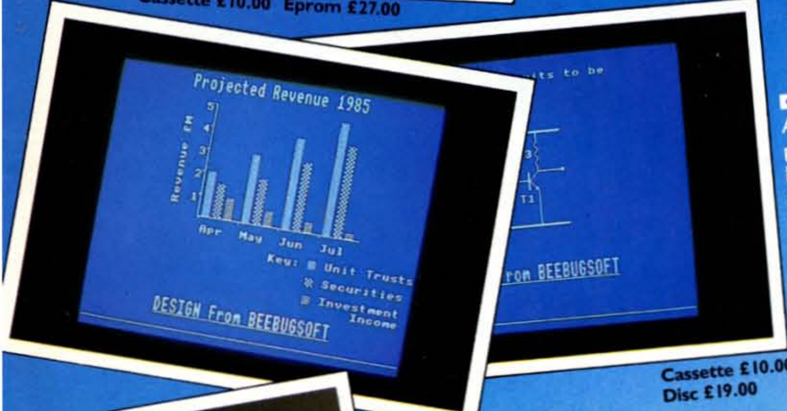
General Commands:     Debugging Commands:
L List memory         @  Set PC
D Disassemble         A  Set accumulator
K Disassemble+save    X  Set X register
N Assemble            Y  Set Y register
E Edit (ESC ends,     P  Set PSW
  space goes back)    S  Set stack pointer
= ASCII to memory     GO Execute program
FS/FB Find string        (space) Simulate
M Move block          /  Step on one level
V Verify blocks       Z  Trace
I Fill                B  Set breakpoint
T Change panel        U  Delete breakpoint
C Calculate           W  Delete all
OB/OW Osbyte/word     J  JSR
! Change paged ROM    ------------------
R Relocate program    ?  Help summary
H Print               Q  Quit EXMON
?_
```

**Cassette £10.00 Eprom £27.00**

**EXMON**
An extremely powerful machine code monitor on cassette or eprom, offering 35 new commands for debugging machine-code.

*". . exceptionally comprehensive . . . would be hard to improve upon"*
YOUR COMPUTER August 1983

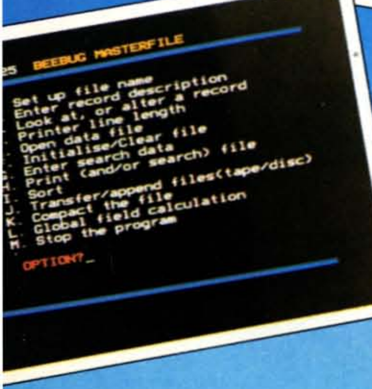
*". . using EXMON is a delight"*
MICRONET May 1984



**DESIGN**
A Computer Aided Design package to allow screens to be quickly created for display, demonstration, handouts etc.

*". . a first rate screen processor . . . immense value to schools and colleges"*
EDUCATIONAL COMPUTING April 1984

**Cassette £10.00**
**Disc £19.00**


```
25  BEEBUG MASTERFILE

   Set up file name
   Enter record description
   Look at, or alter a record
   Printer line length
   Open data file
   Initialise/Clear file
   Enter search data
H. Print (and/or search) file
I. Sort
J. Transfer/append files(tape/disc)
K. Compact the file
L. Global field calculation
M. Stop the program

 OPTION?_
```

**MASTERFILE**
A flexible general purpose database on cassette or disc; the disc version using random access files.

*". . works well and offers an efficient database"*
PCN November 1983

**Cassette £10.00**
**Disc £19.00**

If you would like to know more about BEEBUGSOFT products, see the advertisers' index of this magazine, or telephone us for a full software brochure. BEEBUGSOFT products may now be obtained from major dealers including selected branches of W.H. Smith.

Alternatively all products are available from us on mail order from our despatch department in High Wycombe.

BEEBUGSOFT dept 16 PO BOX 109
HIGH WYCOMBE BUCKS HP10 8HQ

**TEL: ST. ALBANS**
**(0727) 60263**

BEEBUG
SOFT

*Prices include VAT*

# Will you be the first Earthling to win a pla

Acornsoft are issuing a nationwide challenge to all Acorn Electron and BBC Micro users.

It's the challenge to join a new and exclusive group of computer games players: The Elite.

With 3-dimensional graphics, Elite is a game which is light years ahead of any other.

It strictly defines the rank of each and every player.

As your prowess improves, you move into higher ranks.

But make no mistake, to reach the top rank, your performance must become exceptional.

Then, and only then, will you qualify to call yourself a member of The Elite.

**From harmless, you must become lethal.**

In Elite, all players start as equals.

With the initial rank of "Harmless," you will embark upon an experience unlike any that you have known before.

You will be a space trader who roams the universe, making your living from buying and selling the cargo in your Cobra space craft.

On your travels, you will encounter aggressors who are eager to put an end to your dealings.

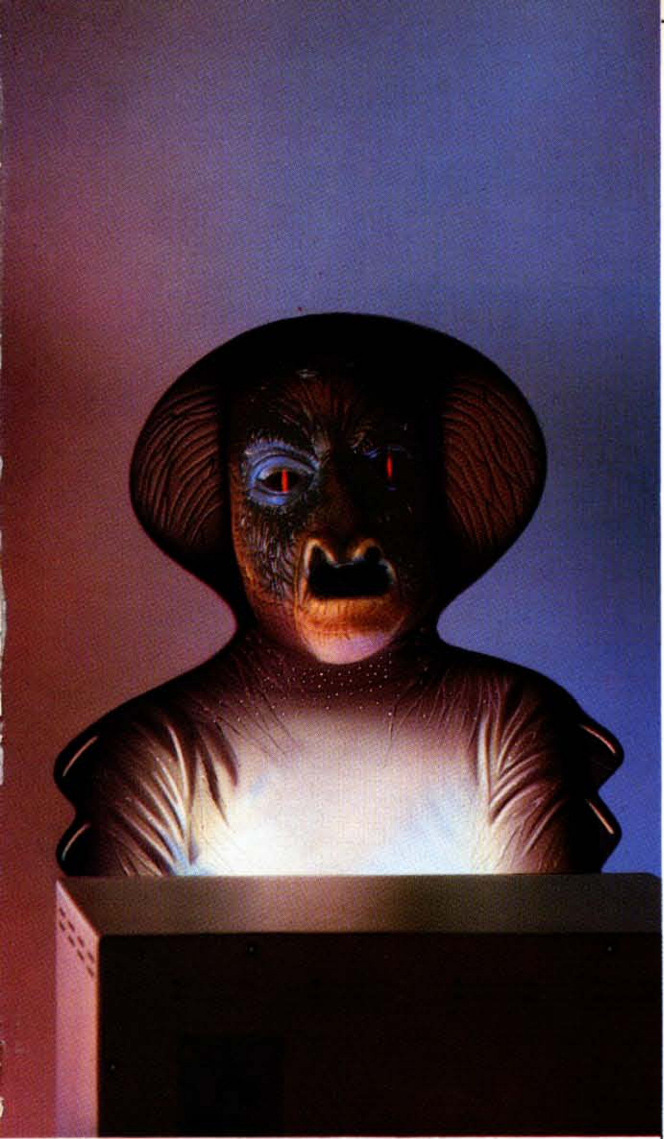
Only the fittest will survive.

As you establish yourself as a survivor, you will win the right to a higher rank.

In all, there are nine, from "Harmless" to "Elite." And your computer will continually tell you where you stand.

**Trade with 2,000 planets in eight galaxies.**

Besides survival, your success also depends on the rewards you reap from the cargo that you carry.



# ce among the Elite?

That cargo can be anything from foodstuffs to contraband. If you decide to trade in contraband, the rewards will certainly be higher. But so will the risks you take.

To ply your trade, you can dock at any of 2,000 planets in eight galaxies.

However, before you dock, you must use your wits to assess the planet's political climate and the perils which may be waiting for you.

Also, in any of the eight galaxies, you may find yourself being asked to perform acts of considerable heroism and selfless courage.

Although these will bring you into danger, they can bring considerable rewards too.

We're waiting to recognize your skills.

Achieving higher status in Elite will tax your skills to the limit. Which is why you must download your game onto cassette or disc each time you take a break from play.

When you reach the rank of "Competent" or higher, you should send us the secret code number revealed to you by your computer.

We will send you in return a special document which certifies your achievement. And you stand to win a valuable prize.

Are you ready to accept the challenge?

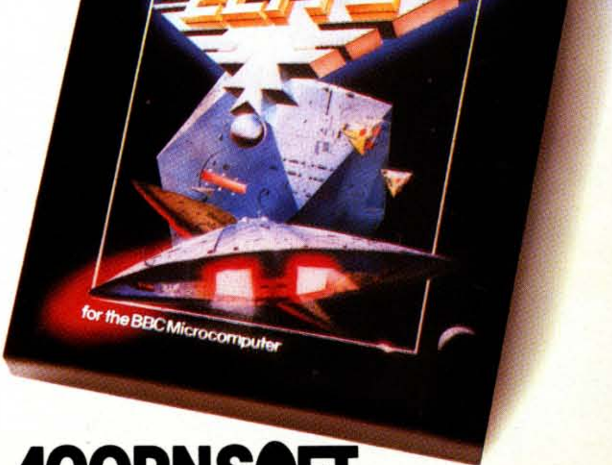
Elite is available on both disc and cassette for the BBC Micro and on cassette for the Acorn Electron.

With either, you will get "Elite: The Dark Wheel," a compelling novel which sets the whole mood of your adventure. You'll also get a flight training manual which will get you fit to roar into the unknown in your Cobra spacecraft.

Your Acornsoft dealer now has the entire package at £14.95 on cassette, or £17.65 on disc (for the BBC Micro) and £12.95 for the Electron. (For the address of your local stockist, call 01-200 0200.) Credit card holders can simply telephone 0933 79300 during office hours.

Alternatively, you can order by post from: Acornsoft, c/o Vector Marketing, Denington Estate, Wellingborough, Northants NN8 2RL.

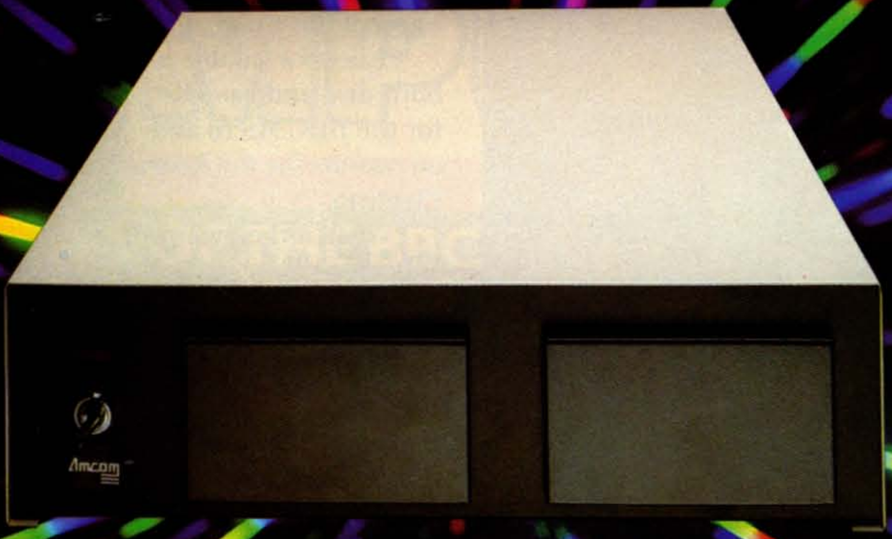
You can also get a free Elite poster by ringing 0933 79300.



**ACORNSOFT**

# E-NET

## EDUCATIONAL NETWORKING FOR THE BBC MICRO



Already proven in a number of UK educational establishments, E-Net is a unique breakthrough in Educational Networking. Utilising the Amcom hard disc system in conjunction with the Amcom File Server, E-Net allows the user to network up to 250 BBC micro's with a choice of hard disc capacity from 5 — 280 megabytes, this combination also provides considerably faster access times than conventional floppy disc based systems. E-Net overcomes many of the problems of disc space usage evident in current networking systems, E-Net will monitor the individual pupils use of disc space and also allow the teacher to allocate varying amounts of disc space to individual users by simple commands from the file server, in addition E-Net will allow full implementation of multi-user random access files.

E-Net is secure because each authorised user is allocated a user number and password unique to that user. Upon switch-on of a client machine, that machine prompts the user to insert their number and password and only at this stage may the user gain access to his programs. For added security, the user number and password are invisible on the screen. E-Net is flexible, at all times the file server has complete control over the client machines and, for example, can force a specific program to one or more machines, can view a particular client machine screen at anytime, and can directly access client machines and display screen messages without interfering with normal operation.

Important files can be easily copied from the hard disc to floppies and one or more printers may be used with E-Net, as these are controlled directly by the file server, this means that the micro's to which the printers are connected are available for normal use whilst the printers are working.

E-Net is a flexible, simple to use yet comprehensive networking system and is available now from Pace. To find out how E-Net can benefit you please telephone for a full specification fact sheet, or to attend a demonstration.

**PACE**

**PACE SOFTWARE LTD.**
**92 NEW CROSS STREET,**
**BRADFORD BD5 8BS.**
**Tel. (0274) 729306 Telex 51564**

THE MICRO USER
OCTOBER 1984

# NEWS

## Z80 cost soars £100, but disc drive drops £50

**IN a surprise move Acorn has put up the price of the Z80 Second Processor by a swingeing £100. But it has reduced the prices of its 100k disc drive by £50. The single disc drive now costs £199 and the Second Processor £399.**

The Z80 price has been increased to enable dealers to offer better support to their customers.

Tom Hohenberg, Acorn's marketing manager, said: "The Acorn Z80 is a complex product with sophisticated bundled software, and customer support is an essential part of the Z80 package.

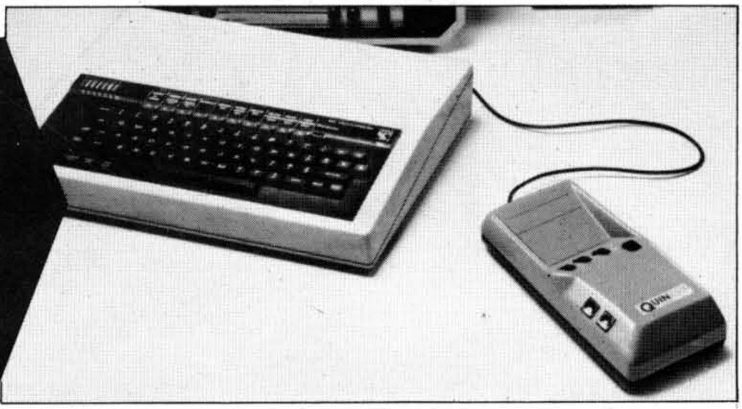
### Stretched

"High demand for the product has stretched the resources of our dealers, so we have decided to provide a larger margin to enable them to expand and improve their customer support services.

"We believe most intending Z80 buyers will still find the product extremely cost-effective.

"The price increase is small compared with the cost of a complete business system, and more than compensated for by our recent £105 drop in the price of the dual disc drive, part of a complete Z80-based system".

## 'Quinkey has the edge on Qwerty'



## BBC MICRO IN MAJOR SCHOOLS STUDY

**A MAJOR study is being launched in the North East into claims that the Quinkey – the hand-held keyboard and learning device for the BBC Micro – significantly improves children's writing ability.**

Funded by the city of Newcastle at a cost of £20,000, it will involve 14 schools, more than 30 teachers, 1,000 pupils – and 23 BBC Micros.

The project will examine numerous provisional claims being made by teachers who have given children – as young as six – the opportunity to use text handling facilities.

It will also look into suggestions that:

- Pupils tend to write more.
- Concentration improves in class.
- Children take a more critical attitude to what they write.
- Punctuation and spelling gets better.
- Even the students' handwriting improves.

Mike Clark, deputy head of the city's Heaton Manor School and project leader, says:

"There is now general agreement that giving pupils access to text handling facilities does seem to improve their whole attitude towards the written word".

Now Mike Clark's team will attempt to establish how valid these initial assessments are. And if they prove to be correct, just what is needed to maintain and extend the benefits?

Although the educationalists readily admit that most Word Processing programs might be expected to bring such results, he believes that Quinkey has three significant advantages.

"Using the program QUADI – which comes as part of the educational package – four pupils can use a BBC Micro simultaneously for text handling, working on their own individual texts up to 72 lines long", he said.

"Their work can be stored on cassette or disc or printed out as required.

*Turn to Page 24*

## *Beeb is Mr Reliability*

THE BBC Micro is the most reliable computer on the market. That is the finding of a major independent quality control exercise just completed.

It reveals that the failure rate for the BBC machine is currently only 1 per cent.

The survey, commissioned by BBC Enterprises, was carried out by Daisley Associates, an independent testing house. They report there has been a "dramatic improvement" in Acorn's quality control since the project was launched several months ago.

However, neither Daisley Associates nor BBC Enterprises were prepared to provide *The Micro User* with further information about the tests prior to going to press.

Instead they were busy making arrangements for a press and TV open day at the quality control test centre to announce the news with all due fanfare.

Meanwhile, over at Acorn yet another spokesman refused to discuss the subject of quality control. But he did admit that the 1 per cent failure figure "sounded right".

## CARRYING THE TORCH

ACORN Computers sales director Peter O'Keeffe has been appointed chief executive of Torch Computers in place of Bob Gilkes, who has resigned as chairman and managing director to take up other interests in the computer industry.

Peter O'Keeffe, 40, will be on secondment from Acorn at the invitation of Torch's major shareholder Newmarket (Venture Capital) Ltd.

In May Acorn signed heads of agreement for the acquisition of Torch, and takeover negotiations are now well advanced.

## Schools study

*From Page 23*

This simultaneous access – for less than half the cost of a computer – improves the cost effectiveness of the expensive micro equipment. It also makes classroom management easier.

"Using another program (PROG) which also comes as part of the total package, it ought to be possible for up to four pupils to have access to almost any program which runs on the BBC using less than 30k of memory.

"No longer is it necessary to share the single Qwerty keyboard of the computer. Pupils can each use their Quinkey pad to assess the program".

### Potential

Mr Clark said Newcastle will be systematically field testing a considerable number of programs – commercial programs, MEP material and the work of local teachers – to explore the potential of this kind of cooperative use of the micro in talk, planning and joint activity.

"It seems possible that the Quinkey keyboard, with only six keys and its way of relating key patterns to letters, makes use of learning strategies and potential which are currently under-valued in education", he said.

"Certainly pupils seem to memorise the Quinkey keyboard much more rapidly than Qwerty, and to reach handwriting speed more quickly too.

### Significant

"More particularly, pupils of widely differing ages with learning difficulties of various kinds relating to reading and writing seem to find Quinkey a significant aid in breaking through the learning barrier".

However, the small group of teachers and advisers so far involved in this work realise that such findings which appear so important need to be explored far more rigorously.

Consequently the project has been established which will involve eight primary schools, three first schools, one middle school and two secondary schools.

# Why Andy missed out in starter pack offer

*Andrew Healey . . . good news from W.H. Smith*

THERE was good news and bad news for regular reader Andrew Healey in the August issue of *The Micro User*.

The good news was that Acorn was giving every purchaser of a BBC Micro a starter pack worth more than £80.

Buyers could choose between a free cassette recorder and five "entertaining and absorbing" software programs, or – if they already owned a recorder – eight programs and a cassette lead.

The bad news was that Andrew, of Norbury, London, had not received his free starter pack when, in mid-July, he'd spent £399 at W.H. Smith's Croydon store. All he got was a micro, manual and welcome cassette.

"Where is my free starter pack?" the 20-year-old student wanted to know.

"I'm sorry, we don't know anything about this offer", he was told when he went back to the shop.

So Andrew wrote to Acorn.

Jennifer Hyde of the company's customer service department wrote back to confirm that Acorn were indeed funding a summer promotion involving giving away free starter packs.

But, unfortunately for Andrew, W.H. Smith "chose not to take part in it".

Undaunted, he then wrote to *The Micro User* to ask if we could help him get his free starter pack. Our articles had, after all, stated that "every purchaser" of a BBC Micro would get one.

Could *The Micro User* have got it all horribly wrong?

"No, it was our fault", confessed Robert Blood of The Quentin Bell Organisation, Acorn's PR agency.

"We sent out a misleading press release. We should have said the offer applied only to those stores electing to take part in the promotion – and we should have listed their names.

"On Acorn's behalf we'd like to apologise to anyone who was misled into thinking they would get the free starter pack at W.H. Smiths and other similar outlets".

So why didn't W.H. Smith take part? John Rowland, the firm's personal computer merchandise controller says they weren't really able to.

"With 70 outlets selling Acorn products we are one of their biggest customers and of course we buy in bulk and organise our stock situation well in advance.

"This Acorn promotion was really only viable for small outlets flexible enough to take on two or three extra micros in order to take advantage of the free pack offer".

Andrew Healey still feels there is a principle involved and, claiming that "every purchaser of a BBC Micro" applies as equally to him as anyone else, has written to Acorn managing director Christopher Curry requesting his free starter pack.

By press time Andrew was still waiting for a reply.

However, he can take consolation from the £50 software voucher W.H. Smith has sent to him as a customer relations gesture after *The Micro User* told of Andrew's disappointment.

# Acorn package aims at doctors

**A DOCTOR'S system based on the BBC Micro that helps GPs run their surgeries marks Acorn Computer's first direct move into Britain's "potentially lucrative medical market".**

**The package, which includes specially written software and an entire disc-based BBC Micro system, contains everything GPs need to automate at a reasonable cost many essential yet time-consuming practice tasks, such as repeat prescribing and patients' record-keeping.**

**Acorn estimates that of some 8,000 practices in Britain less than 5 per cent use computers.**

**The package contains the first part of a suite of programs designed for GP practice.**

**Additional programs under development will handle tasks such as drug usage statistics, an age/sex register for automatic recall of patients and financial administration.**

**Acorn is also developing total packages for dentists and opticians.**

**The Acorn Doctors Package was developed by two practising GPs and costs £1,999.**

# MINI OFFICE HAS MAXI RANGE

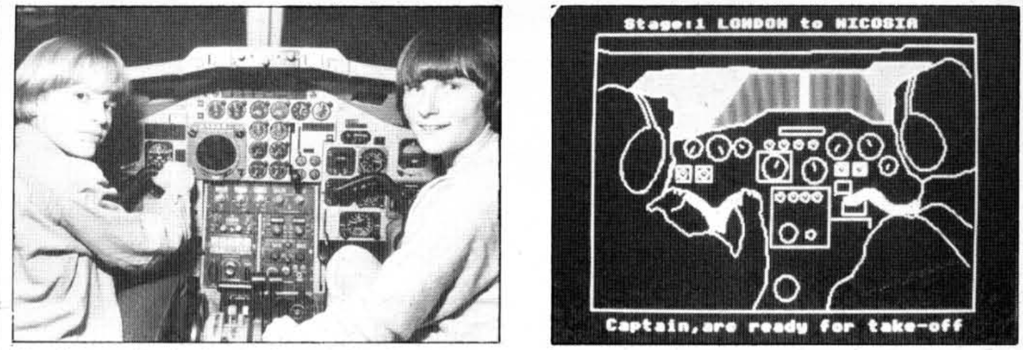
A BUSINESS package with a revolutionary pricing policy which it claims will at last enable the BBC Micro to become an inexpensive office tool has been launched by *The Micro User*.

Mini Office, a professionally written word processor, database, spreadsheet and graphics package for the BBC Micro and Electron machines costs £5.95 on tape and £7.95 on disc.

"We are aiming at one man firms across the country who simply cannot afford to pay for the business software currently on the market with price tags of hundreds of pounds", says Derek Meakin, joint managing director of Database Publications.

"It will also be well in the price range of housewives who wish to use it for correspondence or domestic bookkeeping – or even for children wanting to monitor their pocket money".

Mini Office has been written as a serious introduction to using a home computer in a working environment. And it comes complete with a free 32 page easy-to-use operating guide.



*Simulations for the latest educational adventure programs from the BBC are based on actual photographs.*

# BBC ADVENTURES HAVE EDUCATIONAL IMPACT

**THE British Broadcasting Corporation is poised to carve itself a larger slice of the educational software market for the BBC Micro.**

It is currently running an in-depth survey to identify all available software in order to pinpoint the areas in which it can make the most impact.

"We have reached the stage where the BBC Micro is firmly established in schools", Stefan Nowak, the BBC's software education officer told *The Micro User*.

"Now we need to consolidate its position by putting some good software out. This will ensure the micro becomes an essential part of the school curriculum, rather than risk it being left in the store cupboard gathering dust with the film projector".

The BBC intends to concentrate on well scripted adventure programs as educational vehicles.

And it believes it can successfully increase its market share by exploiting its advantage in the area of school broadcasts – marketing software directly linked to series.

As part of this policy, the corporation has announced that it will shortly release software to accompany four broadcasts in the Introducing Geography Series for 10 to 12 year olds.

"Our aim is to help children acquire a geographer's 'eye' on the subject and in particular the geographer's use of vocabulary", explained producer Mike Howarth.

"Simulations planned use some of the familiar computer games techniques, but only so far as they involve a goal with rewards and penalties.

"However the random element is replaced by a carefully structured but absorbing journey to a successful or sticky end".

The software titles are:

**River:** A plane crashes on a mountain range. The survivor's map only shows the contour lines of the region. Following the map ensures a successful escape. Children find out the landscape features at each stage of the river, the problems rivers can pose to man, and need to interpret a cross section as well as the contours.

**Flight:** Pilot and navigator choose one of several global air routes including refueling stops, given out by the computer. Using atlases, players fill in their flight logs with names of countries, towns, rivers and mountains in order on each leg of the flight.

**Summit:** Players have to supply stores to each camp during an expedition to climb the South West face of Everest, so enabling the team to struggle to the top.

**Nomad:** Players experience the hardship of the Fulani, a race of nomads whose cattle graze the Savanna of West Africa. Using rainfall charts, it is necessary to keep the cattle alive by moving them to areas where they are likely to find water.

"With programs like these, we can make lessons come alive and so emphasise the importance of the BBC Micro", says Stefan Nowak. "And, at one and the same time, increase our market share".

# LOGO CHOICE ON ITS WAY

GOOD news for BBC Micro users who have been waiting patiently for Logo.

Logotron has commissioned a full implementation of the international programming language for the micro from Logo Computer Systems

And Acorn is planning to bring out its own version of Logo.

Logotron's Logo will be supplied on a single ROM and will be fully compatible with Econet, DFS and the second processor. Price will be £59.80.

Logotron is also offering a Sprite board for the BBC Micro fully compatible with Logo offering true animation for £149.50.

Acorn's version of Logo is said to be in the final production stages and is expected to be available "in the late autumn".

NOW that more and more factory machines are computer controlled, there is a big demand for training.

Pictured here is the Starturn, from Denford Machine Tools, which links a mini-lathe to a BBC Micro.

Developed for classroom work in schools, colleges and training centres, Starturn is claimed to teach all the skills needed for operating full-size production lathes.

Software controls feature circular interpolation and screw cutting with specified pitch in inches or metric. Programming can be inch or metric, absolute or incremental.

High resolution for toolpath graphics, for program verification, can be produced on the micro. Programs can be dumped to a printer.

# Broadmoor patients go for computers

PATIENTS at Broadmoor – the hospital for the criminally insane – are taking part in computer classes using the BBC Micro.

The news leaked out when an inmate mailed a computer game he had written to the offices of *The Micro User*.

"Yes, we do have computer classes using the BBC Micro", admitted a spokesman for the high security psychiatric hospital, which houses 550 patients.

"They are part of our education department here".

In fact the level of interest in the BBC Micro at Broadmoor is so high that a number of patients have now bought their own machines.

One of them – who cannot otherwise be identified – was the computer programmer inmate who devised the fruit machine game which duly arrived at *The Micro User*.

"He's in fact our star computer student", confided the hospital spokesman.

"It probably stems from the fact that we've had a very active colour television repair shop here for a number of years", he said.

"Naturally that will have created the interest in electronics. So from there it's only a small step to computers".

Just who is taking part in the computer classes at Broadmoor is a strictly classified area. However *The Micro User* was able to learn that the hospital's most famous current inmate – Ronnie Kray – has not sought hands on experience of the BBC Micro.

"I don't really think that sort of thing interests him", said the spokesman.

# Forth takes priority

SKYWAVE Software now has a 16k eprom that enables the BBC Micro to run programs written in Forth.

It sits in the sideways ROM area and can be placed so as to have a higher priority than Basic so that the micro comes on in Forth instead of Basic.

The version of the language – Multi-Forth 83 – gives a multi-tasking capability. So the user can have a number of Forth programs executing at the same time.

### Limited

Each task is placed in a queue and up to 28 at once are possible. The number of tasks the system can run is limited only by available memory.

The system comes with four pages (1k) available for tasks. This can be expanded as required.

However Skywave says it is finding it hard to get the eproms, so postal buyers should check availability by phone.

# Micros from Dublin

ACORN'S Irish distributor, Lendac Data Systems, is putting £500,000 into a new Dublin factory to make BBC Micros under licence.

Production starts straight away, and 5,000 units are planned for the first year of operation.

Acorn has just opened a Dublin office, and will combine with Lendac in a marketing thrust into consumer, educational and business markets.

Lendac, set up in 1979 by two computer graduates of Trinity College, Dublin, is sole Irish distributor for Acorn.

### Aware

Acorn's Chris Curry said: "Irish schools are becoming increasingly aware of the value of computers, and we expect the educationally-proven BBC Micro to win a substantial share of this business".

Heading Acorn's Irish office is Niall Andrews, formerly with Philips Data Systems in Ireland, who said: "The Irish market is developing rapidly – up to 35,000 home micros for 1984 and probably double that in two years.

"We are confident that Acorn can capture at least 50 per cent of the 'BBC Micro type' market, and over 20 per cent of all home computer sales before 1986".

# BBC Micro a winner at Brands Hatch

WHILE Brands Hatch was playing host to the largest crowd at a British sporting event in recent times – 124,000 people saw the British Grand Prix there – computer history was being made behind the scenes.

For the first time ever at a Formula One racing event a networked micro information system was used to flash information from the pits to the press, officials and motor sport VIPs.

The Acorn designed system involved a BBC Micro positioned in the pit area as a sender unit. Information was networked via Econet to a number of strategically positioned monitors in the large central marquee and the 190 seat press viewing area.

The system was a slightly modified version of that used for the first time at the Acorn Computer European Race Day at Silverstone in June, which featured the European Formula Three championship as the main event.

BBC television motor racing commentator Murray Walker, whose booth – shared with James Hunt – was served by one of the network's monitors, said: "The system proved to be invaluable.

"I was getting up to the minute information from behind the scenes faster than ever before.

"During the race we had a television monitor failure and I was unable to see what was happening on the far side of the circuit. So I used the information coming off the Acorn system to keep viewers in touch".

Teletext and Prestel pages contained in the system also allowed world news and progress of other sporting events to be displayed around the network.

Acorn enhanced the vast international press facilities at the race by providing BBC Micro word processing systems – along with trained personnel to demonstrate their use.

Journalists could use them to prepare and, if necessary, alter their texts before printing perfect copy for sending to their publications.

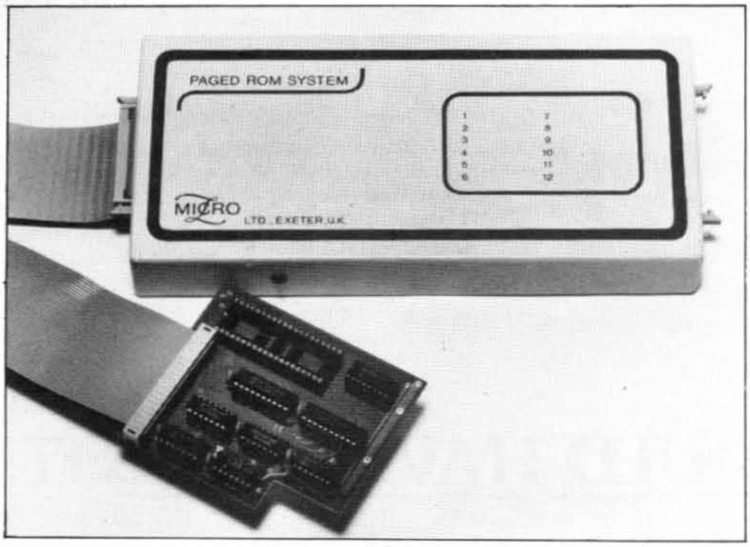
# German challenge

A DAISY wheel printer to challenge Japanese dominance of the low price end of the market has been produced by West German firm Triumph Adler.

The 20 characters-a-second TRD 7020 is designed for personal computers costing from £200 upwards, but is aimed at any system where the primary application is word processing.

A library of more than 150 interchangeable print wheels provides a choice of type styles which can be printed 10, 12 or 15 characters an inch or with proportional spacing. Underlining and shadow print can be used.

Costing £375, the machine is the result of a DM50 million investment in a new robotised manufacturing and assembly facility – developed with the assistance of TA's Volkswagen parent.



# RAM expansion from Micro – Z

WHAT is claimed to be the first software addressable external sideways ROM extension for the BBC Micro has been launched by Micro-Z.

By developing the external sideways ROM board, the appliance removes the need to continually open up the micro's case when exchanging ROMs.

It can be used either inside or outside the micro.

Two circuit boards are utilised and are common to either internal or external application. In both, the CPU board is mounted internally by plugging into the 6502 socket.

The board is designed to occupy minimum space within the micro and not conflict with any space required for other upgrades such as RAM extensions and double density disc boards.

Installation of the system does not involve soldering, and particular attention has been given to minimising heat output and power consumption.

Micro-Z plans to release upgrade modules for its system to provide RAM expansion, combined eprom eraser/programmer, and additional ROM expansion units.

# Patents row a boon to buyers

A DISPUTE between Aries Computers and two firms it alleges are infringing its expansion board patents has resulted in savings for BBC Micro owners.

The Cambridge based company has slashed the price of its 20k RAM expansion – the Aries-B20 – from £115 to £79.95.

Aries managing director Peter Headland explained: "We had planned a price cut but the bare faced plagiarism of a couple of our competitors accelerated the process.

"We are the sole legitimate licensees of the Aries-B20 patent application. This is being flouted by cheap imitations distinguished by corner-cutting techniques.

"Those concerned seem to believe that changing details of the design removes them from the scope of the patent. In fact they can expect heavy legal action. We intend to press for punitive damages.

"These imitation Aries-B20s incorporate features such as the use of chips outside manufacturers' tolerances.

"This is going to lead to a lot of unhappy customers with unreliable systems, which ultimately does nobody any good", Headland said.

# D-DAY ON THE WAY

A COMPANY which started life nine years ago with a few imported copies of Dungeons and Dragons board games has now started to produce micro games of its own.

Games Workshop, which has built up to a £3½ million annual turnover on adventure and fantasy games, has promised BBC Micro versions of "Battlecars" and "D-Day" for the New Year.

# Taking control

A PROGRAMMABLE port control module which connects to the user port of the BBC Micro for experimental computer control has been produced by W.D. Interfaces.

The Portcom contains four single pole changeover relays, each capable of switching up to 3 amps at 28v DC, and two mains outputs, each with a rating of 1200 watts optically coupled.

It features two uncommitted DC outputs controlling voltages up to 50v or currents up to 5 amps with 5v and 12v outputs from the mains derived power supply.

Two 8 LED displays show the status of each output device and each data line of the user port.

The module is available in three versions, £99.95 (cassette), £101.95 (disc) and £115.95 (steel case).

# *Failed your exam? Then try again*

BBC Micro users who failed their O-level and CSE exams will be able to study for their retakes at home, thanks to new software programs launched by Acornsoft/Ivan Berg.

Four revision programs – Maths 1 and 2, English Language and Biology – have been written by teachers for students who are part way through or have completed their appropriate syllabuses.

Each program has up to 150 pages of tutorial, divided into self-contained sections. In English, for example, there are sections on grammar, spelling and comprehension, with on-screen diagrams to illustrate various points.

If a student has difficulty understanding certain parts of a section he can request an overlay giving explanatory text on the screen.

At any time the student can call up a "jotting pad" at the bottom of the screen to take notes or do sums on a built-in calculator.

After studying each section, the student answers a 10 question revision test. If there is a question he cannot answer he is automatically referred back to the relevant tutorial for further instruction.

When at least 75 per cent is scored in all sections, the student is ready to attempt the program's mock examination.

This consists of 30 multiple choice questions to be completed within half an hour.

### Simulated

Realistic exam conditions are simulated. Any question can be passed if the student is unsure and returned to later. A clock displays time remaining throughout and the program automatically ends when the half hour is up.

The micro then marks the exam and displays the percentage mark.

The exam is compiled from a database of 100 questions, so it can be taken many times with a different "paper" every time.

The programs have been written by specialists in their fields. The mathematics and English programs were compiled by a group of teachers from University College School in London and the biology program by educational publishing house Hodder and Stoughton.

Each program is available on cassette at £12.65.

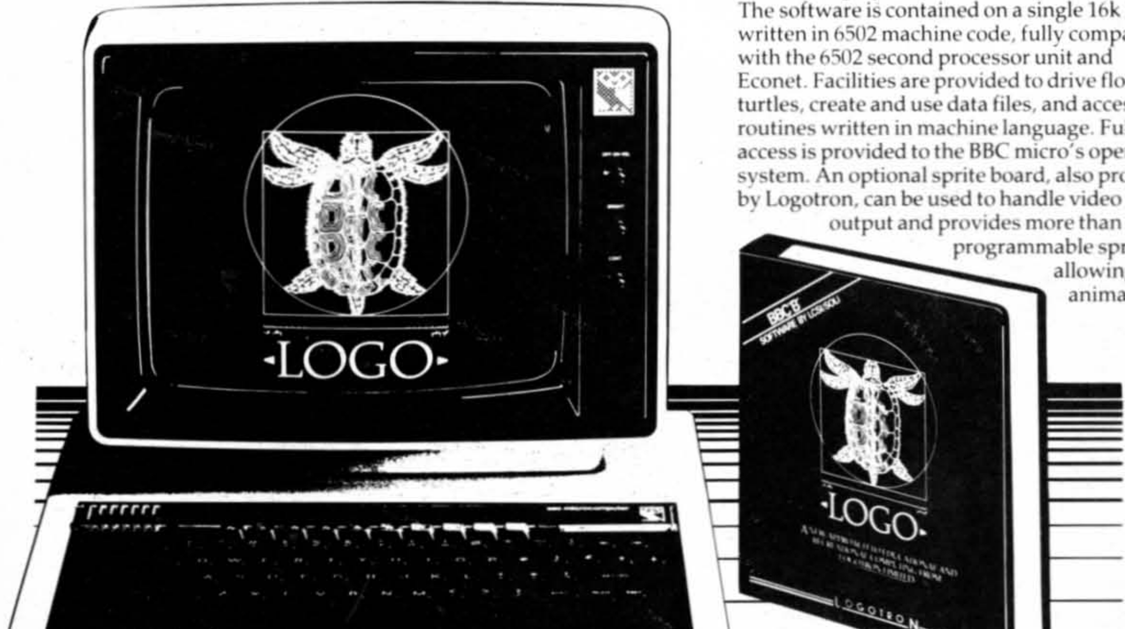
**A full LOGO for the BBC model "B" from Logotron.**

LOGO is a computer programming language, which appeals equally to children in primary school or to computer scientists at the Massachussets Institute of Technology. Using LOGO, you unconsciously absorb advanced mathematical ideas and fundamental principles of computer programming. LOGO has been available on microcomputers only since 1982. Only this year has it been made available on British home computers like the Sinclair Spectrum and the BBC Micro.

# LEONARDO WOULD HAVE LOVED IT!

Leonardo da Vinci would have loved it because LOGO gives full rein to a child's creative imagination, using visual images to convey profound ideas. LOGO could do for computers what perspective did for pictures, bring them alive.

Logotron's LOGO for the BBC "B" was written by LCSI/SOLI, the software house responsible for LOGO implementations for Atari, Apple, IBM, Sinclair, Coleco, and NEC. It's the closest there is to an international LOGO standard, with turtle graphics and full list processing. The software is contained on a single 16k ROM, written in 6502 machine code, fully compatible with the 6502 second processor unit and Econet. Facilities are provided to drive floor turtles, create and use data files, and access routines written in machine language. Full access is provided to the BBC micro's operating system. An optional sprite board, also provided by Logotron, can be used to handle video output and provides more than 30 programmable sprites, allowing true animation.



Please send me further information concerning Logotron's LOGO for the BBC Model "B".

NAME ........................................................................

ADDRESS ........................................................................

........................................ ☐ Educational Establishment;

☐ Home user; ☐ Dealer*; ☐ Distributor*  *attach to company letterhead

If you want to know more about LOGO, send for a descriptive leaflet and price list.

To: Logotron, Dept.MU2. 5 Granby Street,
Loughborough, Leicestershire LE11 3DU.
England.

**LOGOTRON**

# Acorn v Future in adv't rumpus

**ACORN and Future Computers are locked in battle over the latter's press advertisement claims for its micros.**

Acorn has complained to the Advertising Standards Authority because Future Computers has been saying it has "the only micros designed with a built-in networking facility at no extra cost".

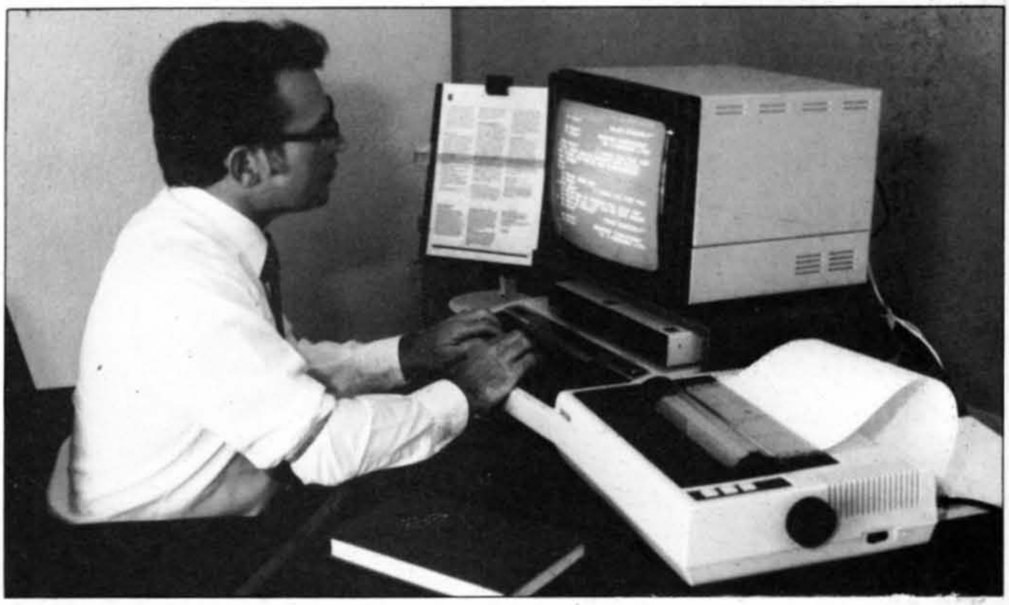
Acorn says this is untrue because the BBC Micro is sold in three versions with built-in Econet networking.

Future counters by claiming Acorn's 8 bit machine "is no longer in the running for the demands that modern business places upon it".

Acorn says the BBC Micro is "extensively applied in small and large firms, for whom networking is one of its most attractive features".

An Acorn spokesman said Future's ad claims were "misleading to the public and unfair to the BBC Micro, since Future Computers clearly does not offer the cheapest networking system available".

At press time both companies were still awaiting a ruling from the Advertising Standards Authority.



# Micro keeps books flowing

A WORD processing system based on the BBC Micro is helping prolific writer Peter C. Smith maintain his annual output of books and major articles.

Smith, author of more than 30 naval histories, ghost stories and novels, decided recently to trade in his old typewriter in favour of the high-tech approach.

So he asked Bedford Computers to put together a tailor-made word processing system.

The company supplied him with a BBC Micro, twin disc drive system, with sideways RAM, Microvitec RS monitor and Epson RX80 FT. Total cost, £1,700.

"I needed relatively cheap equipment that was quick and reliable", said the 42-year-old author.

"The company suggested a BBC Micro system, then took the trouble to demonstrate it in use, so I was sure it was exactly what I needed.

"The memory storage capacity and editing facilities mean I can draw facts together and revise my work as I go along. It is a considerable time saver".

Simon Hodgson of Bedford Computers explained: "Computer packages are OK for most people, but when a client has a specific application we prefer to tailor a cost effective system to fit his specific requirements".

# BBC English – the Acorn variety, of course

"BRITISH English" – the goal of people from Andorra to Zaire who wish to emulate the sounds and syntax of the United Kingdom – is being made more accessible by a project involving Acorn and the British Council.

English language students in six of the Council's overseas centres are learning on BBC Micros in a pilot project of CALL – computer assisted language learning.

The Council believes the CALL project offers individualised, self-paced learning plus stimulation of group discussion and project work.

Dr Martin Phillips of the Council's English language services department and coordinator of the project, says experience of a limited experiment in Munich, and observation of CALL classes in the UK, tends to confirm this view.

The Council's English teaching centres in Abu Dhabi, Barcelona, Hong Kong, Madrid, Munich and Singapore have been equipped with BBC Micros supplied by Acorn. The Council has already begun commissioning software appropriate to the needs of learners and teachers.

Dr Phillips says there is a shortage of readily available high quality software, and developments to date have been "uncoordinated and lacking in a coherent framework".

By the end of the first phase of development, the Council hopes to have produced a package of programs exploring a wide range of different activities and teaching points. It is also planning to develop computer based language testing.

Each centre involved in the project will pilot software in its English language classes, feeding back reactions to provide guidance for the improvement and development of new programs.

**Jeremy Preston**

# New at Acornsoft

**JEREMY Preston has been appointed marketing manager of Acornsoft, responsible for software sales and marketing strategy and the licensing of software on the international market.**

**Preston, 25, joined Acornsoft from Telcom Gold, British Telecom's electronic mail company, last year as project controller.**

**He has an honours degree in computing science and a formal computing background in programming and systems work.**

# Micro in closed circuit viewdata system

**TWO BBC Micro enthusiasts have designed a closed circuit viewdata system for use in factories, shops and schools. And it looks like becoming a commercial success.**

It all started when Mike Chew, quality controller at an electronics factory, combined with a company programmer to devise a closed cicuit system modelled on BBC TV's Ceefax.

The idea was to create an electronic notice board in the factory based on a BBC Micro. Using a key pad, workers could call up pages of news about quality control, sports club results, the day's canteen menu, and so on.

The software comes in two parts. One program, on disc, simulates a typical Ceefax display on screen. And a ROM-based editor provides graphics, oversize text and cut and paste, as well as the usual BBC Mode 7 editing.

## Interactive

Mike Chew thinks there are all sorts of uses for his idea, and he has set up a company to market it, along with two colleagues.

In use, the system is interactive, with a Viewdata-type menu.

As well as being tried out at the local comprehensive, the scheme is being looked at by a bank.

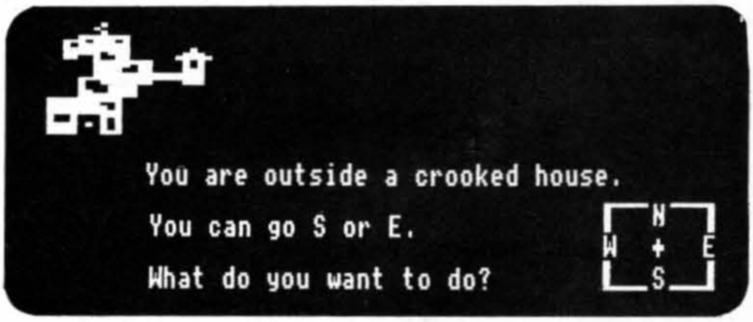
They are considering putting it into their branches to give information to waiting customers.

The pages would be created at head office and a floppy disc copy sent to each branch.

Minor changes to the information – interest rates, for example – could be made at branch level. Each branch would have its own BBC Micro and monitor.

# Read the story, play the game

**...that's the invitation that comes with a novel package announced this month by *The Micro User*.**



You are outside a crooked house.

You can go S or E.

What do you want to do?

The Magic Sword is an adventure game on cassette specially written for young children. But that's only half the story.

With it comes a 48 page full colour book that recounts all the events leading up to the start of the adventure.

All the elements of a traditional fairy story are there – a handsome prince, a beautiful princess, a white castle with secret passages and mysterious dungeons, dense forests, deep caves – and a crooked house in which lives a wicked witch.

All these are in the game as well, plus colourful animated graphics and lots of exciting sound effects that encourage the child to travel through the countryside and explore the castle to find the princess and release her from the witch's clutches.

The game is liberally sprinkled with magic objects the child has to find and collect in order to get through to the end of the story.

The text is in double-height characters. And what is a particularly nice touch is the compass which is on the screen throughout the game.

The directions in which moves are permitted are shown on the compass in flashing mode – a very useful aid for someone new to adventure games.

# Slim line deal

MICRO users can now buy a 100k Canon slim drive for £99 including its case, cables, utilities disc and manual.

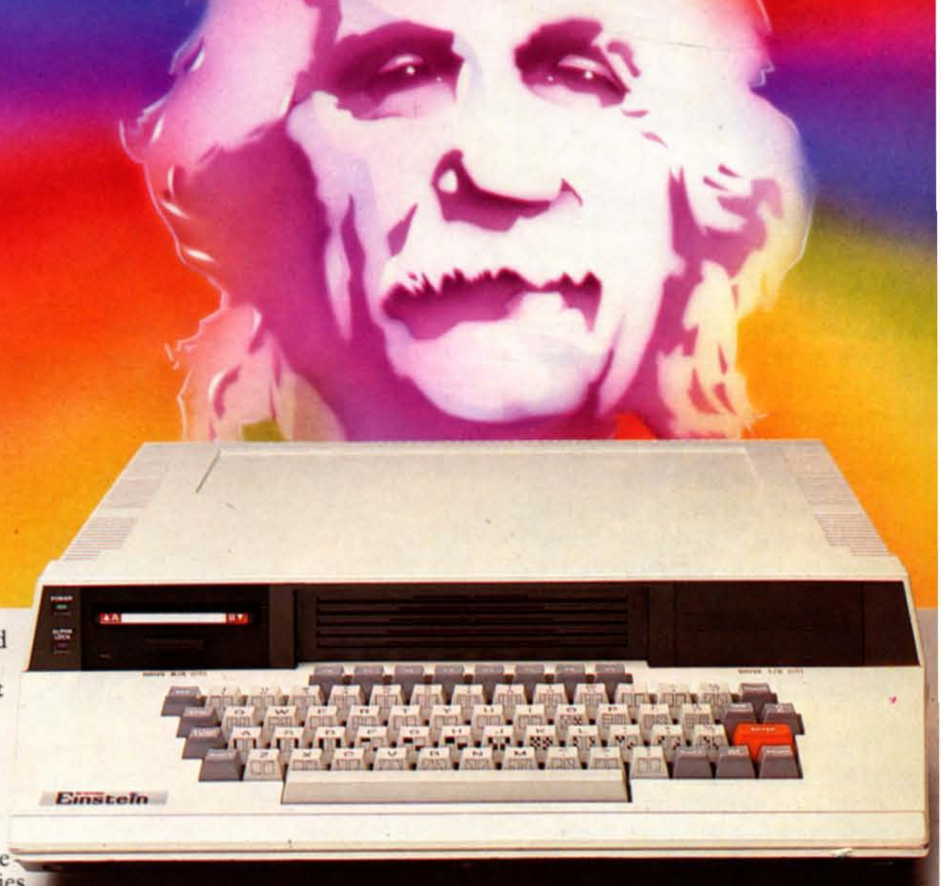
This follows a deal between OEM supplier Alpha Disc and distributor Chase Data, of Woking.

Alpha Disc say they have agreed bulk purchase terms which allow Chase to sell single discs at low margins.

Top end of the range is a Canon 220 slim dual 400k drive, in a case with power supply, utilities disc and manual for £339.

This model also has a 40 or 80 track LED indicator and secondary switching power supply.

# A COMPLETE COLOUR MICRO WITH NO HIDDEN EXTRAS FOR AROUND £499.



The title of 'genius' is not bestowed lightly on man or machine: those extraordinary qualities and powers of intellect are rare.

Einstein had them in full measure. And so now does the new micro computer from Tatung, designed and built in Britain and appropriately named – Einstein.

Einstein was created by Tatung, one of the world's leading electronic companies, and given the capacity and the remarkable capabilities to compete with computers costing far more.

Its simplicity of operation will appeal to the first time buyer and to businessmen who don't want to lose staff to expensive and time-consuming training courses. At the same time its operating system is both powerful and sophisticated to satisfy the most advanced requirements.

For those who have outgrown their existing primitive machine, the speed and capacity of the 500K built-in disc drive will make all the difference. And for the small businessman, the ability to store and retrieve all information in seconds will be as important as Einstein's built-in flexibility, which allows the system to grow as the business develops.

BUILT-IN 80K MEMORY
Total memory capacity 80K RAM divided into 64K 'user' memory and 16K for colour graphics production.

BUILT-IN DISC DRIVE
500K 3" compact floppy disc drive. Potential for massive extra storage with a second 500K disc drive internally.

BUILT-IN 16 COLOUR GRAPHICS High resolution graphic animation from 32 sprites (definable shapes), 16 vivid colours.

BUILT-IN EXPANSION PORTS
Connection to both TV and optional colour monitor, most printers and other computers via RS232C interface. Also twin joystick ports, 8 bit user port, exclusive Tatung Pipe.

BUILT-IN FLEXIBILITY
Powerful Crystal BASIC. Multi-lingual plus ability to run CP/M.†

BUILT-IN VERSATILE SOUND
Sound synthesiser facility includes chromatic music with three voices. Substantial speaker with volume control. Provision for speech synthesiser.

Einstein has them all. Feature for feature, it meets the needs of the novice and the experienced operator, both at home and in the office.

Einstein, designed and built in Britain, is a complete colour micro computer with no hidden extras.

And for under £500 is sheer genius.

**TATUNG**

**Einstein**

**SHEER GENIUS: AT WORK, AT HOME.**

DIAL 100 AND ASK FOR FREEFONE EINSTEIN FOR YOUR NEAREST STOCKIST.

†CP/M is a trade mark of Digital Research Inc.

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The best name in memory

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This is the result, a diskette of top quality, complete with a plastic protective case for the ten-pack (we also sell them individually!) together with index stickers.

Cumana diskettes are available now, as single or double sided 40 or 80 track, from your local computer dealer. Don't trust it to chance, go for the best name in memory . . .

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Cumana Ltd., Pines Trading Estate, Broad Street,
Guildford, Surrey, England, GU3 3BH.
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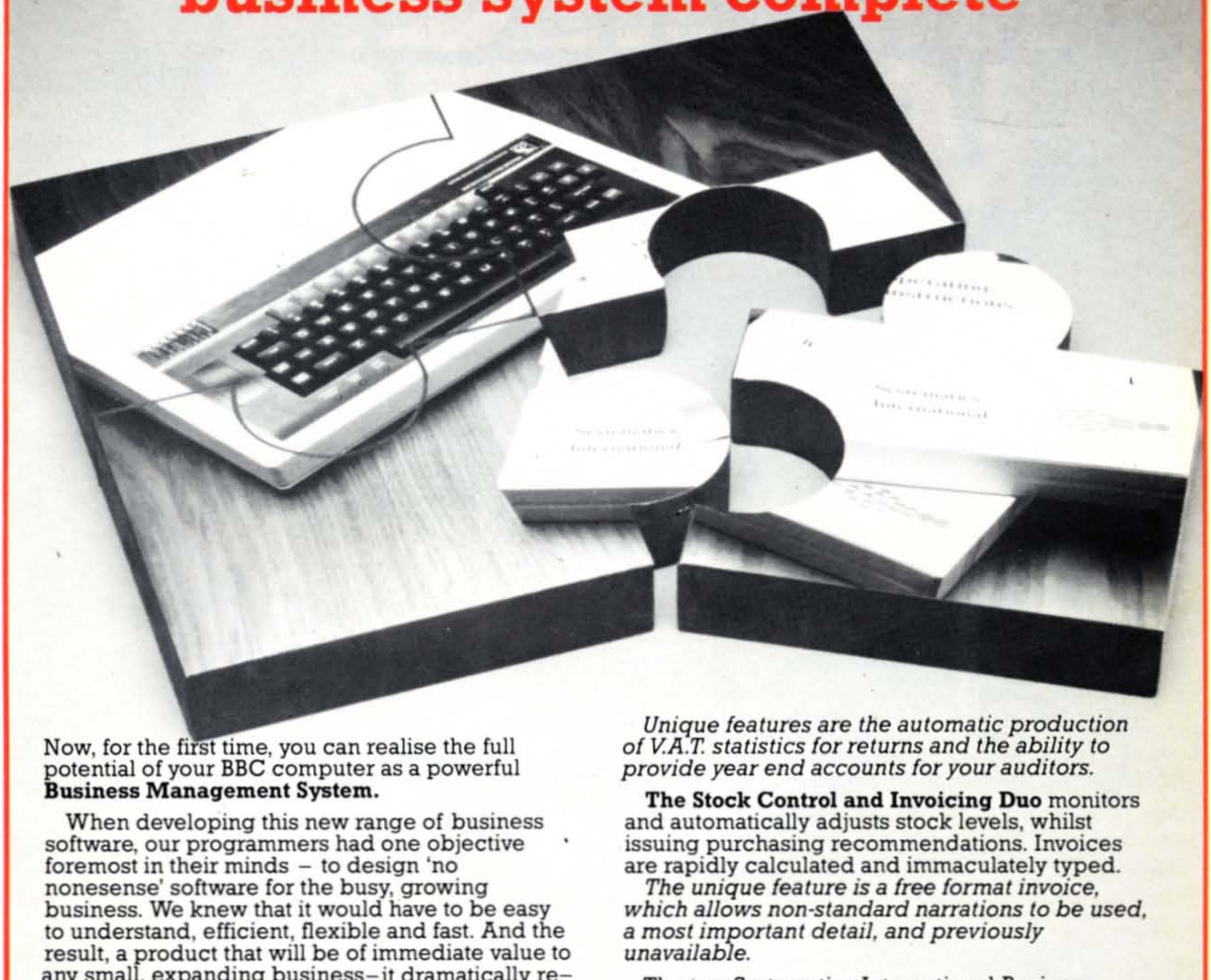
# The last piece to make your BBC business system complete



Now, for the first time, you can realise the full potential of your BBC computer as a powerful **Business Management System.**

When developing this new range of business software, our programmers had one objective foremost in their minds – to design 'no nonesense' software for the busy, growing business. We knew that it would have to be easy to understand, efficient, flexible and fast. And the result, a product that will be of immediate value to any small, expanding business – it dramatically reduces the time spent on administration, and presents printed documentation, to the highest standards.

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*The unique feature is a free format invoice, which allows non-standard narrations to be used, a most important detail, and previously unavailable.*

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Please charge my Access/Barclaycard/Ammex/Diners* card number

☐☐☐☐☐☐☐☐☐☐☐☐☐☐☐☐ Signature ______

Name: ______

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______ Post code ______ Telephone number ______

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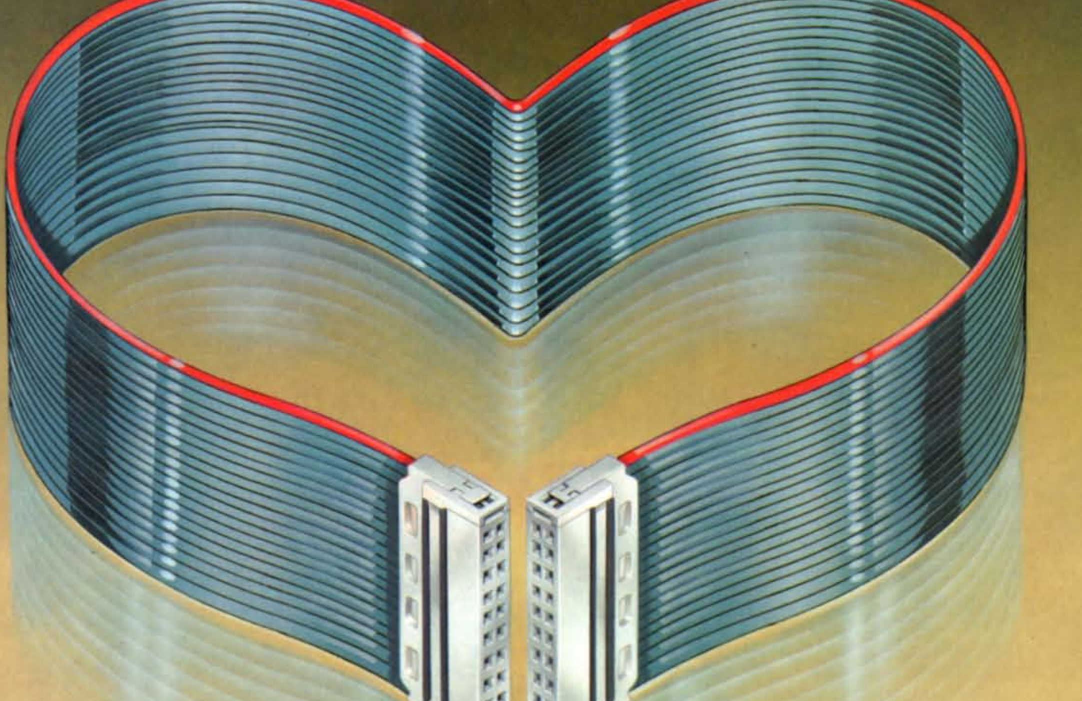
Orders normally despatched within 48 hours.

☐ Tick this box for a leaflet and the address of your nearest S.I. Duo stockist.

MU/10/84

# WHY MICROS LOVE MT80

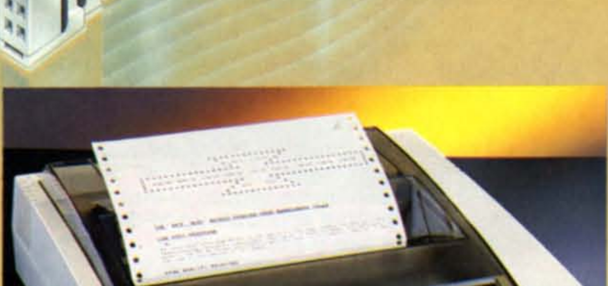


Most leading low cost Micros, eg BBC, Dragon and Sinclair QL love the MT-80 printer from Mannesmann Tally. It is fully hardware compatible and with a range of cable options, gives trouble-free straight through plug-in facilities.

You'll love it too, for its sophisticated looks, and its range of *standard features*, which include 80 col, 80 cps optimised bi-directional printing with dot addressable and line graphs, quick tear-off facility, friction and tractor feed, and easy change cassette ribbon. And all for an ex-VAT price of around £200.

Options include <55dBa sound reduction kit and 2K buffered serial interface.

The dealer who supplies you is supported by Mannesmann Tally, Europe's leading printer manufacturer. Your guarantee of continued support and assistance throughout the life of the printer.



Ask your nearest dealer for a demonstration, or phone us today for full details. Either Annie, Sali, Terry or Geoff will be only too pleased to help you.

**MANNESMANN *TALLY***
***THE FIRST NAME IN PRINTING***

Mannesmann Tally, Molly Millar's Lane, Wokingham, Berkshire RG11 2QT
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## SYSTEMS

### ADVANCE 86

IBM compatible, 128K RAM, 2 x 320K Drives. Price includes: Perfect Writer, Perfect Speller, Perfect Filer and Perfect Calc, plus 12 months on site warranty (monitor available at extra cost). **£1437**

### SANYO 555

80% IBM compatible, 128K RAM, 2 x 160K Drives. Price includes: Wordstar, Mailmerge, Info-Star and Calc-Star. Limited number of SAGE Accounts still available.
(Monitor available at extra cost) **£1148**

### ELECTRON £199

Includes free software tape

### BBC-B £399

Includes free tape recorder. Full range of Software and Disk Drives available.

## PRINTERS

| | |
|---|---|
| Brother Printer HR 15 | £399 |
| Juki Daisywheel 6100 | £389 |
| Daisystep | £295 |
| EPSON RX80 FT | £299 |
| EPSON FX80 | £389 |

· Including lead for BBC.

## DISKETTES

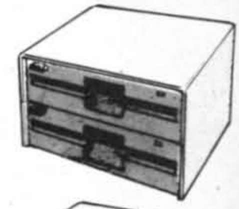
Memorex, in packs of 10

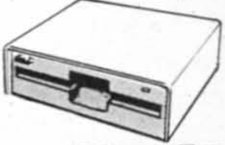
| | |
|---|---|
| SS 40tk | £18.00 |
| DS 40tk | £23.00 |
| SS 80tk | £26.00 |
| DS 80tk | £29.00 |

Including VAT, p&p.

# Stay tuned to Microware for further discounts

## EPSON DISK DRIVES





**200K–400K–800K**

plus new 3½" range (including manual 8 formatter)

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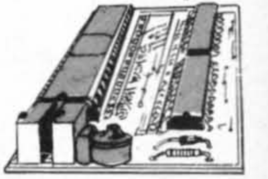
| 100k single unit | £139 |
| 100k dual unit | £229 |
| 200k single unit | £195 |
| 200k dual unit | £325 |
| 400k single unit | £225 |
| 400k dual unit | £349 |
| Switchable | £375 |



### UDM DDFS £95

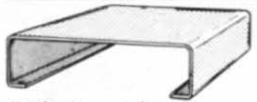
## MONITORS

Microvitec colour

| | |
|---|---|
| Normal res. | £199 |
| Medium res. | £299 |
| High res. | £399 |
| Sanyo/BMC 12" C | £110 |

Call for our full price list.

## ACCESSORIES



Disk storage boxes................ £17.00 (takes 35)
Disk storage boxes................ £25.00 (takes 80)
Prices include VAT, p&p.

BBC Stands................£15.00
Dust covers..................£5.60
(for BBC, Drives and Printers)

## ORDER FORM

| Product | Price | Qty. | Total |
|---|---|---|---|
| | | | £ |
| | | | £ |
| | | | £ |
| | | | £ |
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| | | | £ |
| | | | £ |

SEND DETAILS ON
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01-272 6398

I enclose my order for the above products.

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Address

Signed

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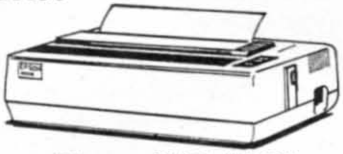
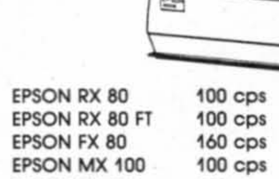
SCI
CANON PW1080A
THE NEW NEAR-LETTER QUALITY MARVEL!
£289 + VAT

## EPSON LOW PRICE SPECIALS FROM £199.00



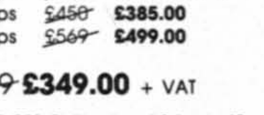
| | | | | |
|---|---|---|---|---|
| EPSON RX 80 | 100 cps | ~~£249~~ | **£199.00** | |
| EPSON RX 80 FT | 100 cps | ~~£285~~ | **£229.00** | |
| EPSON FX 80 | 160 cps | ~~£436~~ | **£324.00** | PLUS |
| EPSON MX 100 | 100 cps | ~~£475~~ | **£369.00** | VAT |
| EPSON RX 100 | 100 cps | ~~£450~~ | **£385.00** | |
| EPSON FX 100 | 160 cps | ~~£569~~ | **£499.00** | |

## JUKI 6100 — ~~£399~~ £349.00 + VAT



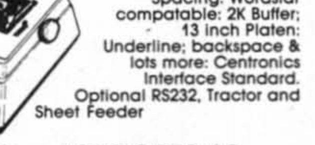
20 CPS: Bidirectional & Logic 10, 12, 15 & Proportional Spacing: Wordstar compatable: 2K Buffer; 13 inch Platen: Underline; backspace & lots more: Centronics Interface Standard. Optional RS232, Tractor and Sheet Feeder

## SHINWA CP80 — ~~£299~~ £179.00 + VAT



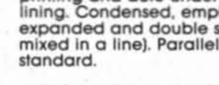
Friction and tractor feed as standard. 80cps. Bi-directional logic seeking 13 × 9 dot matrix giving true descenders, sub and superscripts. Italic printing and auto underlining. Condensed, emphasised, expanded and double strike (can be mixed in a line). Parallel interface fitted as standard.

## ADMATE DP80 — ~~£229~~ £169.00 + VAT



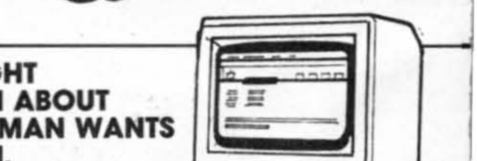
The Admate DP-80 has a large range of features and a low price. Ideal for the first time user. 80 cps; 80 column; Bi-directional logic seeking; block and dot addressable graphics; sub/superscript, auto underline, condensed, emphasised, expanded and italic print.

## QUEN DATA — ~~£299~~ £199.00 + VAT



A wonderful opportunity to purchase a daisy wheel printer at a price you can afford! Features include: 16CPS; Bi-directional; Logic seeking; Proportional spacing; WordStar compatible; 13" platen — 12" print line; Autoscore; Bold and shadow printing; Sub and superscripts; QUME compatible ribbons; QUME compatible daisywheels; 4 level impression control; Prints original + 4 copies; Low noise.

## APPLE TAUGHT MACINTOSH ABOUT MAN. NOW MAN WANTS MACINTOSH.



**Introducing Macintosh.**
Macintosh's brain is the same blindingly-fast 32 bit MC68000 microprocessor that powers the Lisa personal computer.
Its heart is the same Lisa technology of windows, pull-down menus, mouse commands 32-bit power more useful by making Macintosh far easier to use.

**Now for some small talk**
If the problem won't come to Macintosh, you can always take Macintosh to the problem — it weighs 9 pounds less than the most popular portable computer.
Just pick Macintosh up by its built-in handle, and carry it.
A micracle of miniaturisation is Machintosh's built-in 3½" drive. Its discs store 400K — more than conventional 5¼" floppies.

**Programs.**
There are already plenty of remarkable programs available to keep Machintosh busy. Like MacPaint a program that, for the first time, lets a personal computer produce virtually any image that the hand can create.

7 DAYS A WEEK

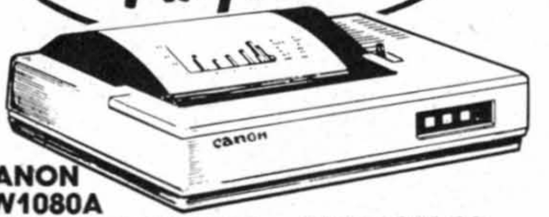
* MACINTOSH AND PRINTER DEMONSTRATIONS DAILY AT OUR SHOWROOMS ON THE HOUR

* SUNDAY OPENING

* 24 HOUR DELIVERY SERVICE

* COMPREHENSIVE TECHNICAL SUPPORT

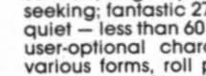
# Phone for a Quote 0730-68521 Anytime



## CANON PW1080A or KAGA TAXAN 810 — ~~£329~~ £289.00 + VAT

80 cols; High speed printing, 160 cps; bi-directional logic seeking; fantastic 27 cps near letter quality; 23 × 18 matrix; very quiet — less than 60 Db; 4, 5, 6, 8, 10, 12, 17 cpi; down loading for user-optional characters; high resolution graphics; handles various forms, roll paper, fan fold, single sheet and multipart copy paper. Also available — wide bodied Canon PW1156A or KAGA TAXAN KP910 — New low prices!

## DAISY STEP 2000 — ~~£299~~ £249.00 + VAT

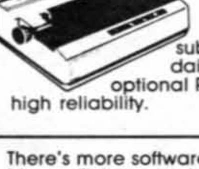


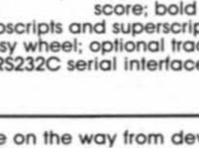
18 cps; Bi-directional logic seeking; 10, 12, 15 cps; Wordstar compatible; 13 inch platen; 12 inch print line; auto underscore; bold and shadow printing; subscripts and superscripts; Qume compatible daisy wheel; optional tractor and sheet feeder; optional RS232C serial interface; low noise; low cost; high reliability.

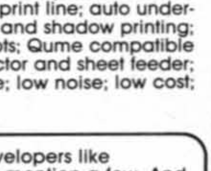
There's more software on the way from developers like Microsoft, Lotus and Software Publishing to mention a few. And with Macintosh BASIC, Macintosh PASCAL and our own Macintosh Toolbox for writing your own mouse driven programs, you could turn a few bob in your spare time.

**All the right connections**
On the back of the machine, you'll find built-in RS232 and RS422 Applebus serial communication ports for connecting printers, modems, and other peripherals without adding expensive cards. If you wish to double Macintosh's storage with an external disc drive, you don't have to pay for a disc controller card — that's built in too.

**Talking of extras**
Macintosh has a built-in polyphonic sound generator capable of producing high-quality speech and music.







Machintosh automatically makes room for illustrations in text.

MacPaint — virtually any image the human hand can create.

Microsoft's Multiplan for Macintosh.

## THE GRAPPLER — ~~£148~~ £102.00 + VAT

Your Commodore 64 can print like a pro!

The Grappler offers a complete answer to printer interfacing, with many capabilities unique in the Commodore market place. Complete signal transmission allows many popular name brand printers to operate perfectly with the Commodore 64. Even Commodore's graphic character set can be reproduced on Epson, Star, Oki, Brother.

Prowriter and other popular printers.

Prints screen graphics without software.

Graphics screen dump routines include rotated, inversed, enhanced, and double sized graphics.

Complete emulation of the 1525 printer for printing Commodores special characters.

Text screen dump and formatting commands.

22 unique text and graphics commands.

## CANON PJ 1080A — ~~£459~~ £399.00 + VAT

Seven colour printer ideal for the BBC, Sirius, Apple, etc. Seven colours print on demand ink jet printer; 70 cps bi-directional; high resolution graphics; will print on acetate sheets for overhead projection; long life ink cartridges 3.5 million characters per cartridge; eight bit parallel interface; Epson compatible; easily replaced colour cartridges; accepts single sheets; interchangable character sets.

Access MasterCard AMERICAN EXPRESS VISA

24 hour nationwide delivery by Securicor £9.50 + VAT Bankers orders; Building Society Cheques; Postal Orders; same day despatch. All orders covered by the Mail Order Protection Scheme.

**MANY MORE PRINTERS AVAILABLE 1,000s OF BARGAINS — SEND NOW FOR THE FAMOUS SCI (UK) CATALOGUE**

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**SCI (UK) Unit 16, Inmans Lane, Sheet,**
**Petersfield, Hants GU32 2AN**

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**Hants GU32 2BR.**
**Tel. 0730 68521.**
**Telex 88626 MYNEWS G**

**PERSONAL CALLERS WELCOME AT OUR MAGNIFICENT NEW SHOWROOMS AT**
**12 High Street, Petersfield,**
**Hants GU32 2JG.**

We wish to acknowledge the several well known trade marks used in this advertisement

URGENT ORDER

SCI (UK) FREE POST,
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PLEASE RUSH ME__________

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# Watford Electronics

**Dept. BBC, CARDIFF ROAD, WATFORD, HERTS. ENGLAND.**
**Tel: Watford (0923) 40588/37774 Telex: 8956095 WAELEC**
**ACCESS ORDERS Tel: (0923) 50234**

SPECIAL OFFER

## BBC Micro
## (Model B)
**New Low Price**
**Only: £326**

Price includes
a **FREE** Data Recorder
PLUS five software
programs worth £80.
**(At Watford we give you a great deal for your money)**

| | |
|---|---|
| 6502 2nd PROCESSOR | **£175** |
| Z80 2nd PROCESSOR | **£262** |

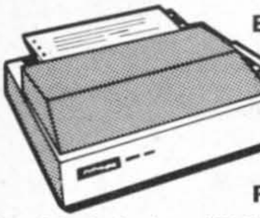
| | |
|---|---|
| TORCH Z80 DISC Pack | **£695** |
| TORCH Z80 2nd Processor | ONLY **£295** |

| | |
|---|---|
| BBC Micro with ECONET | **£375** |
| ECONET Upgrade Kit | **£55** |
| File Server Level 1 | **£85** |
| File Server Level 2 | **£215** |
| Printer Server EPROM | **£41** |
| Clock Terminators (1 pair) | **£95** |
| 10 Station Lead Set | **£25** |
| ECONET User Guide and Cable | **£10** |

### Dust Cover for BBC Micro

Protects your expensive Micro from foreign bodies while not in use. **£3.50**

### EPSON



### RX80

One of the classic printers: 100 CPS, 9 x 9 dot matrix, dot graphics, condensed, double width, normal and italic. 10" carriage; bi-directional logic seek. Centronics parallel interface.

ONLY **£229** (£7 carr.)

### EPSON RX80 F/T PRINTER

As above but with friction feed capability built in. This allows the use of plain paper sheets.

**£245** (£7 carr.)

### PRINTER INTERFACE BUFFER

This neatly packaged, self-contained unit is supplied complete with all leads, operating manual and power supply. Computer output to the printer is stored in the buffer so that the computer can continue with other tasks while the printer works from the stored contents in the buffer. 16K holds approximately 10 pages of A4, close to the full memory of Wordwise. The 48K model is very useful for extremely large documents that otherwise tie the computer up for hours while being printed.

| | |
|---|---|
| Price: 16K | **£115** |
| Price: 48K | **£149** |

### Epson FX80 Printer

The most popular printer in the Epson range. Features include 160CPS, 11 x 9 matrix, proportional spacing, superscripts, subscripts, graphics, many character fonts, user definable character set, margins. Tractor and Friction feed built in as standard. 10" carriage width with bi-directional logic seek for maximum speed. Centronics parallel interface standard.

ONLY **£316** (£7 carr.)

| Type | Ribbons | Dust Covers |
|---|---|---|
| MX80FT | £4.75 | £4.50 |
| MX100/FX100 | £10.00 | £5.25 |
| FX80 | £4.75 | £4.95 |
| RX80 | £4.75 | £4.50 |
| GP80 | £4.50 | – |
| GP100 | £4.95 | £3.95 |
| GP250 | £5.95 | £3.95- |
| GP700 | £18.50 | |
| KAGA KP810 | £5.95 | |
| CANON PW1080 | £5.95 | |

### RX & FX PRINTER INTERFACES

Epson interfaces fit inside the printer to allow connection using techniques other than Centronics.

| | | | |
|---|---|---|---|
| RS232 | **£35** | RS232 + 2K Buffer | **£59** |
| IEEE 488 | **£65** | 2K Parallel | **£58** |

### BROTHER HR-15
DAISY-WHEEL PRINTER

This is a high-quality daisy-wheel printer, for the price of a dot matrix. Daisy-wheel quality gives a professional look to your correspondence. Facilities include 18CPS, bi-directional print, 3K Buffer with clear facility, carriage skip movement, text copy switch, proportional spacing, underlining, bold, shadow, super and sub-script, printing in two colours. Impact control allows use of carbon paper. Connects directly to the BBC micro with centronics parallel interface. RS232 interface is an optional extra. Other options are a single sheet feeder that automatically feeds up to 150 single A4 sheets and a keyboard to transform the printer into a sophisticated electronic typewriter.

**SPECIAL OFFER**
ONLY **£339** (carr. £7)

| | |
|---|---|
| Single Sheet Feeder | **£195** |
| Electronics KEYBOARD | **£135** |
| TRACTOR FEED Attachment | **£90** |

RIBBON CARTRIDGES:
Fabric **£3;** Carbon **£3;** Multistrike **£6**
DAISYWHEELS (various typefaces) **£18**

### LISTING PAPER (Plain)

| | |
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| 1,000 Sheets 9½" Fanfold Paper | **£7** |
| 2,000 Sheets 9½" Fanfold Paper | **£13** |
| 1,000 Sheets 15" Fanfold Paper | **£9** |
| Teleprinter Roll (Econo paper) | **£4** |

### PRINTER LABELS
**(On continuous fanfold backing sheet)**

| | |
|---|---|
| 1,000 90 x 36mm | **£5.50** |
| 1,000 90 x 49mm | **£7.75** |
| 1,000 102 x 36mm | **£6.25** |

Carriage on Printer Paper or Labels £1.50

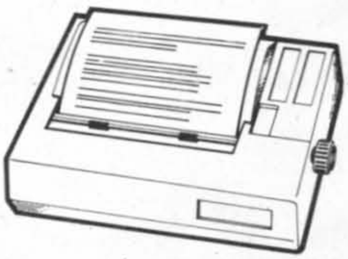
NEW

### DPW1 120
### DAISY WHEEL PRINTER

At last a low cost, high quality daisy wheel printer that everyone can afford, yet there are no compromise in facilities available – 20 CPS, bi directional, logic seeking, print 10, 12 & 15 pitch, proportional spacing, QUME Protocols, QUME Ribbon, QUME Daisywheel 96 characters, maximum characters per line: 180 at 1/15" pitch, copy capacity: 4 copies Centronics Interface, Supports all Wordstar features, paper width 13" max., Optional extras: RS232-C Interface, tractor feed attachment, single sheet feeder.

**Amazing Introductory Offer:**
**£219** (£7 carr.)

### KAGA KP810



What do the press say:-
*"At £269 this is an unbeatable product for what it has to offer."* – Educational Computing.
*"Offers excellent value for money."* – Electronics & Computing.
This new Japanese printer has EPSON FX/RX compatible control codes and is functionally equivalent to an FX80 with the added advantage of its 'Near Letter Quality' mode. It is solidly built and features include: Normal, Italic, Enlarged, super/subscript, proportional spacing and user-defined character set. Extras over the FX80 included in the price are Near Letter Quality (NLQ) print ideal for correspondence, properadjustible tractor feed, half speed quiet mode and 3K buffer. The prihter is bi-directional and logic seeking to give a speed of 140CPS for high throughput in conjunction with the standard 3K buffer. 8K RAM may be added to give more user-defined character sets: Centronics parallel interface + Watford's 12 month NO QUIBBLE WARRANTY.

Special Offer: ONLY **£235**

RS232 interface + 2K buffer to connect to other micros **£89**

### KAGA KP910 PRINTER

Very similar to the KP810 but with 17" carriage for really wide print. Gives 156 columns of normal print or 256 columns in condensed mode. This printer is ideal for printing out spreadsheets and can also be used for correspondence in NLQ mode.

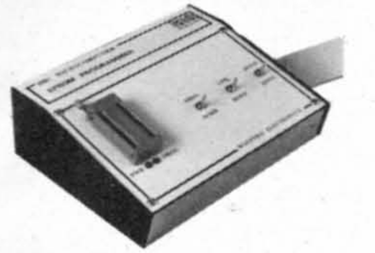
ONLY **£349**

### PRINTER LEAD 36"

Centronics lead to connect BBC micro to EPSON, KAGA, SEIKOSHA, NEC, STAR, JUKI, BROTHER, SHINWA etc. printers.

| | |
|---|---|
| STANDARD (3 foot long) | **£7** |
| EXTRA LONG (5 foot long) | **£10** |

## EPROM PROGRAMMER



The Watford Electronics' EPROM programmer for the BBC micro is a high quality self contained package. Programs all popular EPROMs from 2K to 16K: 2716, 2516, 2532, 2564, 2764 and 27128. All manufacturers' specifications have been followed to program EPROMs at the correct speed – wrong timings could destroy your EPROMs. The unit has its own power supply so does not put heavy loads on the BBC power supply as do some other units. Connects directly to the 1MHz bus following all Acorn recommendations on addressing and bus loadings.

**SOFTWARE PACKAGE**
The software is supplied on an EPROM which plugs into the Micro and is instantly available with a single command (no time wasting as on Cassette/disc loading). It is a fully purpose designed and integrated package to simplify ROM development. The system is menu driven with many prompts to avoid any accidents.

**Software facilities include:**
Load File – Save File – Down Load EPROM – Program EPROM – Verify – Blank Check – Editing of memory contents prior to programming.
Also included is an automatic system to allow Basic programs to be put in EPROM and accessed through the *ROM filing system. More than one program may be put in an EPROM. All these facilities and more are explained in the comprehensive and clear 15 page manual.

ONLY **£79** (£3 carr.)

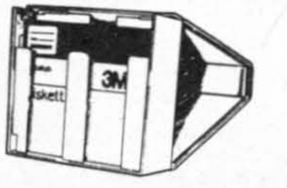
WATFORD – Always a step ahead

## TEX EPROM ERASERS

EPROMs need careful treatment if they are to survive their expected lifetime. Over erasure of EPROMs very rapidly turns them into ROMs! The TEX erasers operate following the manufacturers specifications to give the maximum possible working life by not erasing too fast. We use these erasers for all our own erasing work.

- **ERASER EB** – Standard version erases up to 16 chips. **£28**
- **ERASER GT** – Deluxe version erases up to 28 chips. Has automatic safety cut-off to switch off the UV lamp when opened. **£30**
- Spare UV tubes. **£9**

## NEW DESIGN PLASTIC LIBRARY CASES

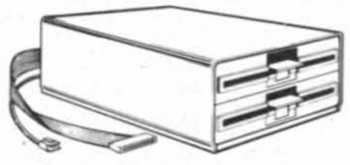


**for Disc Storage** 5¼" (holds 10) **£2**

## DISC DRIVES

(All Drives are NEW SLIM-LINE Type)

### NEW LOW PRICES

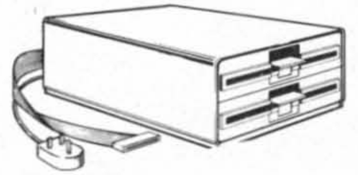


(DRIVES Cased with Cables; connects directly to your BBC Micro)

- **CLS 100** Single, TEC Single sided 40 track 100K, 5¼" Disc Drive **£112**
- **CLS200** Single Drive, Double sided 40 track, 200K, 5¼" **£129**
- **CLS400** Single, Mitsubishi Double sided 80 track 400K, 5¼" Disc Drive **£165**
- **CLS400S** Single, Mitsubishi Double sided 40/80 track Switchable, 400K, 5¼" Disc Drive **£199**
- **CLD200** TEC Single sided 40 track 200K, twin 5¼" Drives **£225**
- **CLD800** Mitsubishi Double sided 80 track 800K, 5¼" TWIN Drives **£325**
- **CLD800S** Mitsubishi Double sided 40/80 track switchable, 800K, Drives **£349**

**P.S.**
You do not require a formatting disc nor the expensive 40/80 track switchable drives if you use Watford's sophisticated Disc Filing System which has all these facilities in the ROM.

## (CUMANA) DRIVES CASED WITH PSU & CABLES



- **CS100** TEC Single sided 40 track 100K 5¼" Single Disc Drive **£129**
- **CS200** TEC Single sided 80 track 200K 5¼" Single Disc Drive **£175**
- **CS400** Mitsubishi Double sided 80 track 400K 5¼" Single Drive **£199**
- **CD200** TEC Single sided 40 track 200K 5¼" TWIN Disc Drives **£265**
- **CD400** TEC Single sided 80 track 200K 5¼" TWIN Disc Drives **£349**
- **CD800** Mitsubishi Double sided 80 track 800K 5¼" TWIN Drives **£399**
- **CD800S** Mitsubishi Double sided 40/80 track Switchable 800K TWIN Drives **£425**
- SPARE DRIVE CABLES, SINGLE **£6**; DUAL **£8**
- DFS Manual (comprehensive) **£7.50** (No VAT)

## DUST COVERS

(For our Disc Drives)

| | |
|---|---|
| Single (without PSU) | **£3.20** |
| Twin (without PSU) | **£3.85** |
| Single (with PSU) | **£3.25** |
| Twin (with PSU) | **£3.90** |
| Twin (side by side) | **£3.95** |

## 5¼" DISKETTES

Top quality 3M and XIDEX diskettes with a lifetime guarantee. These discs are quiet in operation and insert positively with their reinforced hub rings. Boxes of 10 supplied with disk labels and write protect tabs.

| | |
|---|---|
| ● 10 SCOTCH / 3M + labels S/S S/D | **£15** |
| ● 10 SCOTCH / 3M + labels S/S D/D | **£17** |
| ● 10 SCOTCH / 3M + labels D/S D/D | **£24** |
| ● 10 XIDEX + labels S/S D/D | **£15** |
| ● 10 XIDEX + labels D/S D/D | **£24** |

## DISC ALBUMS

Atractively finished in beige leather-look vinyl, these conveniently store up to 20 discs. Each disc can easily be seen through the clear view pockets.

**£4.25**

## LOCKABLE DISK STORAGE UNITS

Strong plastic cases that afford real protection to your discs. The smoked top locks down. Dividers and adhesive title strips are supplied for efficient filing of discs.

| | |
|---|---|
| M35 holds upto 40 discs | **£13** |
| M85 holds upto 95 discs | **£18** |

### FLOPPY HEAD CLEANER KIT

The heads in a floppy disc drive are precision made and very sensitive to dirt. Drive manufacturers recommend that you clean the heads approximately once a week. Unless your home or office is dust free one of these kits is a very sensible precaution against losing valuable data. A dirty head can destroy many disks before you realise the trouble. Very simple to use.
Only **£14**

## BBC Micro WORD-PROCESSING PACKAGE

A complete word-processing package (which can be heavily modified to your requirements, maintaining the large discount). We supply everything you need to get a BBC micro running as a word-processor. Please call in for a demonstration.

**EXAMPLE PACKAGE**
BBC Model B, Watford Electronics' DFS upgrade, Twin 200k Teac drives in beige, Zenith 12" Hi-resolution monitor (Green or Amber), Brother HR15 daisywheel printer. Gemini software: BEEBCALC spreadsheet, analysis and DATABASE software on disc. 10 x 3M discs, 500 sheets fan-fold paper, 4way mains trailing socket, manuals, all leads and BBC carrying case.

ONLY **£1,189** (£15 carr.)

## ACCESS HOT LINE (0923 50234)

(24 hours)

Continued →

## MONITORS

We stock a range of monitors to suit all needs. Choice of a monitor is a matter of personal taste so we recommend that whenever possible, you ask for a demonstration at our shop.

**MICROVITEC**

- 1431 – Medium resolution as used on the BBC television computer programme ... **£174**
- 1451 – High resolution, suitable for word processing in mode 0 ............... **£295**
- 1441 – Super High res, exceeds the capabilities of the BBC micro .......... **£389**

All Microvitec monitors are 14" RGB in their distinctive right angled case. They come with the connecting lead to the BBC and a mains plug.

**KAGA**

- Standard resolution with RGB and composite video inputs ....................... **£195**
- High resolution colour ............... **£259**

Kaga monitors are 12" RGB colour with antiglare screen and user access to screen controls.

**ZENITH**

12" Ultra high resolution monochrome monitor. Ideal for word processing as its green or amber screen is very restful to read. The high resolution makes it good for games too – you can really see the detail that has been put into the graphics. ........................ ONLY **£75**

**LEADS**

| | |
|---|---|
| BNC for Zenith | **£3** |
| RGB lead for KAGA | **£5** |

**N.B.** Carriage on Monitors **£7** (securicor)

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## Versatile **BEEB SPEECH SYNTHESISER** Unit

Beeb Speech Synthesiser

SIMPLY the best! – An unlimited speech synthesis system. Complete with easy-to-follow manual. Controlling software is in ROM so no Cassette Loading problems!
PHONEMES for word synthesis – That means unlimited vocabulary! No extra speech dictionary chips to buy!
BUILT-in Library of approximately 500 words to get you started.
ENGLISH accent – Utilises inflexion techniques to produce highly comprehensible speech.
EASY to use system – Just plug the software ROM into a socket, the Speech unit into the User Port, and away you go! No specialised 'dealer upgrade' required!
COMPACT unit – The whole system is built into a small case – easily tucked behind the computer. Auxillary output socket provided for direct connection to an external amplifier.
HOURS of fun! – Suitable for any application – Games, Educational Programs, Specialised Packages.

We know this all seems to good to be true but DON'T BE LEFT SPEECHLESS! Order your Versatile Speech Unit now!

**Only £44**

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## Best cost less at WATFORD

## WATFORD'S LAUNCH OF THE YEAR

## APEX

The ultimate expansion system for the BBC microcomputer. It enables you to increase memory capacity to 2+ MEGABYTES including BATTERY BACKED-UP RAM.

The system consists of a mother board which fits inside the BBC and further daughter cards can be connected externally. The internal card has the following features:

- 15 ROM/RAM sockets, 11 of which can be configured as 2716, 2732, 2764, 27128 EPROMS or ROM equivalent devices or as 6264 RAMs. Any RAM is Automatically battery backed-up and it's contents preserved when the power is turned off.
- The battery is recharged every time the machine is turned on and lasts several months, depending on the number of RAMs fitted.
- There is very little extra current drain, even with a fully loaded board as only the presently active ROM is powered up. In fact the fully populated board uses only 300mA.
- The board reduces micro bus loading by up to three ROM loads, which improves reliability and performance.
- Installation is extremely simple. There is no soldering required. The board is rigidly held by two 40 pin sockets and five support posts. A ribbon cable can be brought outside the computer and up to 8 external cards added. This enables the user to plug-in up to 142 paged ROMs. The cards have following features:
- Each card can accommodate up to 16 devices each of which can be configured as 2716, 2732, 2764, 27128 ROMs or 6264 8K RAMs.
- Battery backup is provided from the internal card.
- Only the active ROM is powered up permitting many external ROMs to be added with very little current loading (100mA per card).

The system comes with controlling software in ROM. The utilities supplied are as follows:

★ APEX – replies with the device number currently being accessed.

★ APEX C – toggles between the colour and standard black and white messages.

★ AL – loads from any device, regardless of the data type.

★ AS – saves memory to any specified RAM device.

★ AD – prints a directory of the devices present in the system, i.e. ROMs present and files stored. This also reports on the amount of free storage space.

★ AF – asks for the free RAM devices.

★ LA – repeats the last command to paged ROMs.

Continued

★ AT – enters a memory testing routine. This will write a test pattern into the memory and read it back out again. If a fault is found, it is reported to the user. This test continues until Escape is pressed.

- RDISC – activates APEX as a filing system which then treats all free APEX RAM in the system as a continuous 'RAM-DISC'. All commands have similar format to the DFS and transfer is possible between the two systems.

The complete computer system bus is available to the user, so that other cards/devices could be added such as EPROM programmers, second processors, Winchester disc drives, clocks, etc. By racking the cards you eliminate the tangled mass of cables that usually accumulates around the micro.

A comprehensive operating manual is supplied with every APEX Board. Please write in for further details and prices.

---

## THE ULTIMATE DFS FOR BBC MICRO

by

**Watford Electronics**

Highly acclaimed at The ACORN and BBC MICRO USER Shows. What do the independent press say?

Good value for money – *Beebug Aug. '83*

A very worthwhile package – *The Micro User*

You'll be buying a very powerful package – *Personal Computer News*

Superior DFS; Excellent disc sector editor – *Computer Answers*

Without a doubt, the most sophisticated DFS Software yet written for BBC Micro Computer. This powerful new DFS is fully compatible with ACORN DFS yet has much increased power due to additions, carefully designed to make life easier in normal use. It consists of over 14K of efficiently written machine code. It is entirely self contained and so does not require a utilities disc to function.

Please write in for full technical specification.

***PRICES:***

**DFS** (Disc Filing System) ROM **£29**

**Complete Disc Interface Kit including DFS ROM & Fitting instructions £99**

**Disc Filing System Manual.** Comprehensive and clearly written £7.50 (no VAT)

P.S. We will exchange your existing ACORN DFS or PACE (AMCOM) DFS for Watford's highly sophisticated 16K DFS ROM for **£25**

Watford's DFS is exclusively available from Watford Electronics. We do NOT retail through any dealers. Every ROM carries a label with our LOGO and a serial number.

**Now available:**
Acorn DFS Kit ................ **£99**

---

## EPROMs & CMOS RAMs

### NEW LOW PRICES

| | |
|---|---|
| **2764-250nS (8K ROM)** | **£5.25** |
| **27128-250nS (16K ROM)** | **£19** |
| **6116-150nS (2K RAM Low Power)** | **£5.25** |
| **6264-150nS (8K RAM Low Power)** | **£28** |

## BEEB PRINTER ROM

"Makes Printing Childs Play"

This utility ROM is designed to simplify using all the facilities of your printer. It has many facilities:

★ Selection of printer modes such as underline, font and size is by 'Single Key' operations.

★ From Wordwise, a single number following OC will select a mode rather than a long and incomprehensible string of control codes. This makes using your printer with Wordwise much more convenient.

★ When using Basic (or other languages) you can have control over the formatting of the output to the printer in the style of a wordprocessor. You can define page top, bottom and side margins etc. with intelligent page skip for binders an option. All supported printers will now respond to form-feed etc. commands.

★ User defined characters are printed as you see them on the screen so that non-standard characters are automatically printed out correctly.

★ Commands select the options for the following printers:
GP100, STAR, NEC, MX/FX, KAGA, LP/VII/DMP100, DMP200.
Operates with either parallel or serial interfaces.

★ Supplied with a 50 page manual that is very comprehensive and easy to follow. Please specify printer type when ordering so that we can send the correct function key strip.

**Price: £24**

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## DUMPOUT 3

A highly sophisticated screen dump ROM. This has to be the most flexible and powerful screen dump ROM yet produced for the BBC micro.
It will put on paper anything you see on the screen, including all Mode 7 facilities etc. We have to admit that there is one facility that we cannot replicate – if anyone can supply flashing ink we would like to know!
The ROM also provides window setting facilities and two new OSWORD calls that allow mode 7 graphics pixels to be read and plotted using the standard graphic co-ordinate system. Two commands are used to operate the dump routines:
*GIMAGE – This provides a full graphics dump of any Mode (including Mode 8). There are various optional parameters but you need only specify the parameters you wish to change.

- V <scale>, H <scale> – These 2 byte numers give fine control over the size of the dump from minute to enormous. Unlike other dump ROMs the scale does not change with mode.
- R <0-3> – Print dump rotated by 0.90, 180, 270 degrees.
- I <indent> – Set gap from left edge of paper.
- X <min>,<max>, Y <min>,<max> – The whole of the screen graphics window area is dumped except when these parameters are given.
- P – Physical colour values are used for plotting, otherwise a negative scale is used (white darkest).
- T Two tone dump for maximum resolution.
- M <mask> – 8 bit colour mask.
- E – Contrast expansion to make mode 7 text and separated graphics stand out from the background.
- C – All mode 7 graphics are printed as contiguous to improve the shading in graphic areas.

*TIMAGE <indent> – Does a fast, text only, dump of the contents of the text window in any mode.
*GWINDOW and *TWINDOW – These commands draw the graphics and text windows, respectively, on the screen and allow them to be changed with the cursor keys. N.B. GIMAGE and GWINDOW work fully in mode 7.
Designed for use with the following printers: CP80, GP80, GP100, GP250, STAR, KAGA/TAXAN, NEC, SHINWA, GEMINI, EPSON MX/RX/FX,LPVII, DMP 100/120/200/400, CANON.

Price including comprehensive manual **£22**

APPROVED for use
with teleco[illegible]on systems
run by Briti[illegible]unications
in accorda[illegible]e conditions
in the instructions for use.

# MODEM 84

## PRESTEL TERMINAL

**For the BBC Microcomputer**

COMMUNICATION
WATFORD ELECTRONICS GIVES YOU THE KEY TO WORLD COMMUNICATION

The Watford Prestel package allows B.T. approved connection to Prestel, Micronet and many other 1200/75 baud databases for about the cost of a good tape recorder.
Prestel gives you access to an incomparable database covering almost every subject under the sun. There is Micronet with lots of free programs that you can download and run. Details of clubs and user groups, a diary of meetings and exhibitions, news and reviews, technical information etc. There is Homelink with online banking. And there is armchair shopping, travel information, entertainment, world news, sports news, weather information, electronic mail and lots more.
The basic Prestel subscription is only £5 per quarter and at off peak times there is no charge for access time. A local phone call facility means no long distance phone calls to Prestel (approx. phone cost is only 40p per hour).
The Watford Prestel package consists of the B.T. approved Watford MODEM 84 (1200/75 baud full duplex 1200 baud half duplex direct connect) and a very sophisticated Prestel Terminal ROM.
This totally machine code software:

- is fully compatible with not only the Modem 84 but also with the PRISM 1000 and most other modems that require a data link via an RS423/RS232 port making it a worthwhile purchase for those who already have Modems.
- supports full Prestel colour alpha and graphic characters including double height, flashing, conceal/reveal.
- called by simple *PRESTEL (*P.) command. Disc and tape configurations fully supported.
- includes a comprehensive telesoftware downloader for BBC and other programs with continuous on screen status report (an essential facility).
- has very powerful OFF LINE MAILBOX editor allowing colour flashing graphic mailboxes to be prepared without having to be on line to Prestel.
- auto logon sequence can be burnt into ROM if desired.
- a vital 'TAG' facility allows tagging and recall of interesting pages, avoids that common and annoying 'NOW WHERE WAS THAT PAGE' problem.
- includes simple page and program loading and saving functions for both disc and tape, automatically assigning frame and program directories.
- not one but TWO PRINTER DUMP ROUTINES are provided within the software allowing either full graphics dump (mode 7 to EPSON compatible printers) or ASCII characters only.
- a user function built into the software allows interface with specialist routines, (yours as well as ours).
- All the above facilities are accessed via function keys. An overlay is provided to give comprehensive guidance to key functions.
- A 34 page comprehensive instruction/operating manual is supplied.

## WATFORD'S 1200 BAUD FULLY AUTOMATIC USER TO USER SOFTWARE

Having purchased the WATFORD PRESTEL TERMINAL which includes the 1200/75 baud MODEM 84 the addition of the WATFORD user to user ROM based software enables you to discover a whole new world of data communication.
This software enables you to use the MODEM 84 very powerfully.

- Send and receive error checked programs and files (even WORDWISE files) to and from other users at 1200 baud.
- 8k file transfer in under 2.5 minutes (approx four times faster than with 300 baud modems).
- The transfer of data is totally AUTOMATIC which means that the modem is automatically switched between transmit and receive under software control.
- A chat mode is provided which also has this automatic switching for receive and transmit. (This mode is essential just before and after data transfer when both hand sets are replaced to reduce noise).
- A copy facility is provided which allows transmission of all screen output.
- A continuous on screen modem status report is included.
- The software is totally function key driven enabling easy transmission, reception, saving and loading of programs and files (Basic, Machine code or Data).
- A help menu is available from within the software as an aid to use.
- Full instructions are supplied.

### PRICES

PRESTEL SOFTWARE ROM ONLY
(incl. Comprehensive Manual ..... **£20**
PRESTEL PACKAGE comprising:
WATFORD MODEM 84, SOFTWARE
ROM and Comprehensive Manuals ....
**£82** (carr. £2)
USER TO USER SOFTWARE ROM **£14**

## EPSON DUMP ROM

This screen dump ROM is specifically designed for use with the Epson RX/FX printers and the Kaga KP810. It is extremely simple to use as there is only one command to remember. It will accurately dump any screen mode using multiple tones as required. Mode 7 is fully supported giving teletext graphics, double height etc. For those who like to keep life simple this EPROM is only **£20.**

## FORTH ROM for BBC

This ROM provides a complete implementation of the FIG-FORTH standard (including editor). Supplied with a large tutorial manual at only **£33**

**TINY PASCAL for BBC Micro £59**

## VIEW

**VIEW WORDPROCESSOR**
We are supplying the new VIEW version 2.1 allowing printing of memory contents etc. .. **£49**

### FX80 PRINTER DRIVER
### Watford's own TWO Sophisticated PRINTER DRIVER for VIEW

To simplify using the full facilities of the Epson FX80 or Kaga KP810 use this printer driver. Full facilities are provided for selecting between fonts etc. The disc includes examples of use and instructions. Available on 40 or 80 track disc (please state which required). **£6**

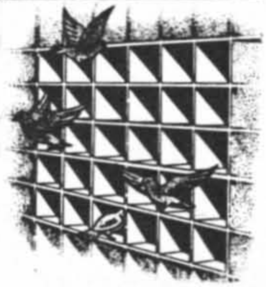
### WATFORD ELECTRONICS VIEW PRINTER DRIVER FOR SILVER REED

We are pleased to introduce a new range of printer drivers to complement the Silver Reed range of printers and typewriters and the View wordprocessor. These drivers have been officially approved by Silver Reed, for use with their printers and typewriters.
The View driver allows access to all of the features supported by the range of daisy wheel printers (EXP 700/400/500/550). These include underlining, bold, shadow, superscript, and subscript printing. Additionally, you can use proportional spacing on the EXP 700. Owners of one of the typewriters in the range EXP 55/44/43, using it as a printer, can also access underlining with these drivers.
The features of each printer/typewriter are accessible from the two highlight codes, which can be redefined at any point within the text.
The printer drivers also extend the facilities in View to allow the use of pad characters.
The printer driver on disk with a user manual is at a special introductory price of **£7.50.**
Please specify printer type when ordering.

**WATFORD ELECTRONICS**

Continued →

## TWO DATABASE MANAGEMENT SYSTEMS



### DISCDATA

Discdata is an entirely disc based database handling system. It is extremely easy to use through its comprehensive menu system. The simplicity is such that we do not feel the need to provide explanation on use in the written guidance supplied with the program. The first-time database user will rapidly become familiar with this package designed throughout to be simple and obvious.
Despite the ease of use this system provides all the facilities needed for complex data handling problems. The length of database that can be handled is only limited by the total space on the disc. You can have up to 20 fields with page length records up to 254 bytes in length. Adding and deleting records, amend titles, field names and records. Sort on any field and search for any record or group of records in any field. The database may be re-formatted after creation, the system will re-write all your files for you automatically. You may add extra fields and extend the length of existing fields freely. Output formatting is very powerful. You are allowed 40, 80 or 132 column output modes going to printer or screen. Selected fields can be put in any order on the screen or printer, either across the paper or down. Output can start or stop anywhere in the file. Decimal fields are automatically totalled and records output are counted. Version 2, now on sale has improved input and amendments procedures giving full record edit as well as the 3 extra features . . . String searching, Calculations on numeric fields, and the ability to create sub files from your main files.

On disc at **Only £17**

(Please specify 40 or 80 track when ordering)

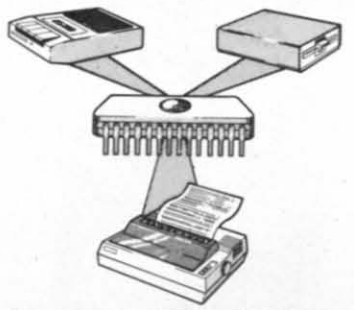
### FILE-PLUS

The File-Plus package is even more powerful and flexible than Disc-Data. It is also largely menu driven but has its own command language for file searching. The 16K ROM contains all the normally required routines, with lesser used options supplied on the utilities disc. All input and output formatting is controlled through screen forms. A full screen editing system is used to define a form which allows tremendous flexibility in the format in which your data is displayed. It is very easy to change from form to form so that you can type in your data with one form, and examine it with others. You will typically design several forms before starting to access the database so that you can quickly and easily see the fields of each record that you want to appear in the layout you decide on. The form system is also used for output to your printer. File Plus has a unique file linking system that allows the entire on-line storage of your system to be used for one database. This can give around 1.5 Megabyte databases using dual drives and double density.
The built in FQL (File-Plus Query Language) can be used for searching the database. Presented in the form of a powerful command language with looping facilities etc. this allows the most flexible access to your data possible. Full arithmetic operations are provided to allow the system to be used for statistical analysis. Operations supported are −, +, *, /, +−9999999999.9999 and compare facilities = >,<>,+=, >=, <, &,.
Many keywords are supported by the language: assign, compare, display, end, goto, iff, ift, print, read, search, spool and update.
Supplied with a very detailed 70 page manual to explain all the facilities with many examples.

**Only £43**

(Please specify 40 or 80 tracks for the utilities disc)

## BUFFER & BACKUP ROM



For those with sideways RAM fitted in their machines this utility ROM will make full use of this facility. By using the sideways RAM area for extra memory the following features are implemented:
★ 4K or 16K buffer for parallel printer.
★ Dumps selection of Disc files to Tape.
★ Makes backup copies of tapes on to tape and disc.
★ Displays contents of paged ROMs on screen.
★ Menu display of ROM filing system contents on Shift-Break.
★ Comprehensive manual.

**Only £22**

## DATAGEM

Gemini's 24K ROM based DATABASE Management System

Special Introductory Offer: **£99**

## *WONDERFUL WATFORD*

## PEN PAL–VERSATILE LIGHT PEN SOFTWARE

Do you have a light pen that never gets used? Then this piece of software is for you. This package offers many useful facilities that make the light pen a useful device to own. Facilities included are:

- Pixel, Line and Character definition
- Free hand drawing
- All Colours
- Fill, Refill and stripes
- User defined "Brush strokes" plus character definer
- Grid, Scale and perspective aids 2 to 200 points palletable in one design with Circles and "rubber banding"
- Move design/character to any screen position
- Save and Load screens, User defined characters and line drawings for video titles, own programmes etc.

This program has many uses in education and at home. It is supplied with a comprehensive instruction manual.
Works with Watford, RH, Acorn User, DIY and many other Light Pens.
Prices

| | |
|---|---|
| TAPE | **£10** |
| DISC (40 or 80) | **£11** |

## DISC EXECUTOR

**Disc Executor** is a sophisticated disc utility for the transfer of your cassette programs to disc. If you have difficulties transferring your cassette software to your disc system then this is the answer. It handles 'locked' files and full length adventures (up to &&e blocks) and programs that load below &E00. It is very simple to operate with instructions supplied. It saves you time and money.

Price **£10**

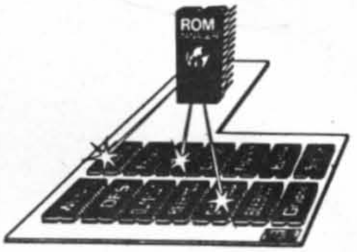
(Please specify 40 or 80 track discs)

## ADE

Complete program development package in a 16K ROM. Full assembling and debugging facilities provided.

SPECIAL OFFER ONLY **£43**

## ROM MANAGER



This ROM is unique in its capabilities. It allows you, the user, full control over the BBC Micro's sideways ROM paging system with simple to use commands. This ROM is essential for those with several ROMs. At a simple level ROM MANAGER can be used to remove the problem of clashing command names and allow full use of all the facilities of your ROMs. This is coupled with facilities to completely enable or disable various ROMs in the machine including ROM manager itself.
ROM MANAGER can also be used to develop sideways ROMs using the machine's standard memory. This is achieved by sending sideways ROM calls to your code in RAM, saving the expense of fitting sideways RAM for ROM development purposes. ROM status reports are also given by the ROM, including ROM lengths, checksums, entry points supported and current filing system title.
The ROM also provides facilities to examine ROMs, list function keys for editing, modify RAM (using a HEX/ASCII editor) and list ROM titles neatly and concisely.

The commands given in the ROM:
• **CHECKSUM** – Generates a CRC for a specified ROM (useful for testing suspected faulty ROMs).
***DIRECT** – Passes a command directly to a named ROM (overcomes command name clashes).
***EXAMINE** – Allows examination of a named ROM
***EXPLAIN** – Gives detailed explanation of the first 22 *FX codes.
***FILE** – Passes a command directly to the current filing system (which normally receives commands after all the ROMs).
***FUNCTION** – Lists the contents of the function keys in a form suitable for editing.
***INCLUDE** – Allows the main memory to be used for ROM development.
***MODIFY** – Memory editing in HEX/ASCII format.
***NAMES** – Lists the names and socket numbers of all resident ROMs.
***RAM** – Sends command directly to the RAM based ROM routine.
***REMOVE** – Removes RAM based ROM option.
***SPECIFY** – Selects the default ROM.
***DEFAULT** – Sends commands directly to the default ROM without having to give its name.
***STOP and *START** – Disable and enable any named ROM to completely eliminate command word clashes.
***STATUS** – Information about all the ROMs fitted in the machine including socket number, name, length, whether it is enabled, whether it has service or language entries etc.
***VALUES** – Gives ROM MANAGER status information, such as its socket number, how many ROMs have higher priority, number of default ROM and the identity of the current filing system.
***VECTOR** – Same as *DIRECT, just in case *DIRECT clashes with another ROM.
All selection between particular ROMs is by the name of the ROM and this may be abbreviated for convenience. ROM numbers can also be used if required. This ROM is very simple and obvious to use. All the facilities are explained in the clear and detailed manual.

Price **£22**

Watford's own Machine code Monitor ROM written by Andrew Bray (Cambridge), co-author of the BBC Micro Advance User Guide.

The most powerful and versatile machine code monitor ROM yet written for BBC Micro. It has all the normal memory editing, moving and relocating facilities, plus all editing is with a full screen editor allowing scrolling up and down memory, entering in Hex, ASCII or standard assembler mnemonics.

In use as a debugging tool, you run code under a total emulation system. Everfelt a desperate urge to set a break point in ROM? No problem – you can even have breakpoint on reading or writing locations in memory and on register contents. The system fully supports debugging of sideways ROMs e.g. BASIC can fully and easily be run from within Beebmon and from there DFS and other sideways ROMs can be used in total emulation mode.

Beebmon can even run itself. In so doing you can nest Beebmon up to a level limited only by the memory size. Beebmon uses 256 bytes of workspace, located anywhere in memory, even on the 1MHz Bus. Beebmon effectively uses no zero page workspace, so your program (e.g. BASIC) can use any or all of the base page. How does it achieve this? By providing a 6502 interpreter all programs running under it exist in a virtual BBC, so special memory locations like the ROM latch are not actually accessed by your programs, instead they alter a location in Beebmon's workspace. Emulation also allows immediate return to Beebmon command level by ctrl-escape no matter what code is being excuted at the time. All this exceptional power and flexibility is complemented by a clear and detailed manual included in a value for money price of:

**£22**

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Disassembler Rom

Discover the hidden secrets of BASIC and the OPERATING SYSTEM with this easy to use programmers tool.

A ROM based machine code Disassembler for the BBC micro. It enables machine code programs to be listed in BASIC/DUMP format and thus is the perfect complement to the built in assembler. It allows Sideways ROMs, files on disk or tape to be listed, and also has a comprehensive editor, allowing mnemonics to be altered directly, as well as HEX, DECIMAL, ASCII and BINARY memory editing. There is also a full set of labelling facilities available (up to 3,200 labels), with the major locations and routines already labelled.

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abcdefghijklmnop
ABCDEFGHIJKLMNOP

ABCDEFGHIJKLMNOP
abcdefghijklmnop
ABCDEFGHIJKLMNOP

ABCDEFGHIJKLMNOP
abcdefghijklmnop
ABCDEFGHIJKLMNOP

**ABCDEFGHIJKLMNOP**
**abcdefghijklmnop**
**ABCDEFGHIJKLMNOP**

ABCDEFGHIJKLMNOP

It works in modes 0, 1, 2 and 4 using the full colour capabilities of each mode. Characters are printed in the same way as normal. Selection between the various fonts is very easily achieved with Ctrl-V – press this followed by a font number and the output will continue in the new font. Beebfont ROM is particularly useful in display work with the characters produced at twice the normal size.

You can create your own character fonts with the editor supplied. You can also print-out pre-formatted text files using the special characters with Epson FX, RX and NEC printers. The full range of character styles can be used, controlled from within the text. The editor and spooler program are supplied with the package, on cassette or disc. The spooler allows word processor (Wordwise & View) output to be printed in the new characters.

A twenty page manual is supplied. Please state printer type and media for the editor & spooler when ordering (cassette, 40 or 80 track disc).

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- The board is compatible with a vast range of software and hardware available for the BBC microcomputer, including our ROM expansion board and double density DFS.
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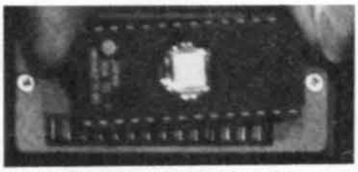

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- Fits neatly into the existing cartridge slot on the lefthand side of the BBC Micro keyboard.
- The low profile design of the socket gives unrestricted access to the keyboard, unlike other cartridge systems.
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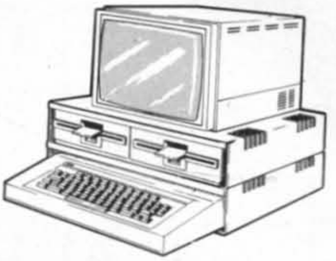

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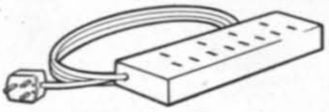

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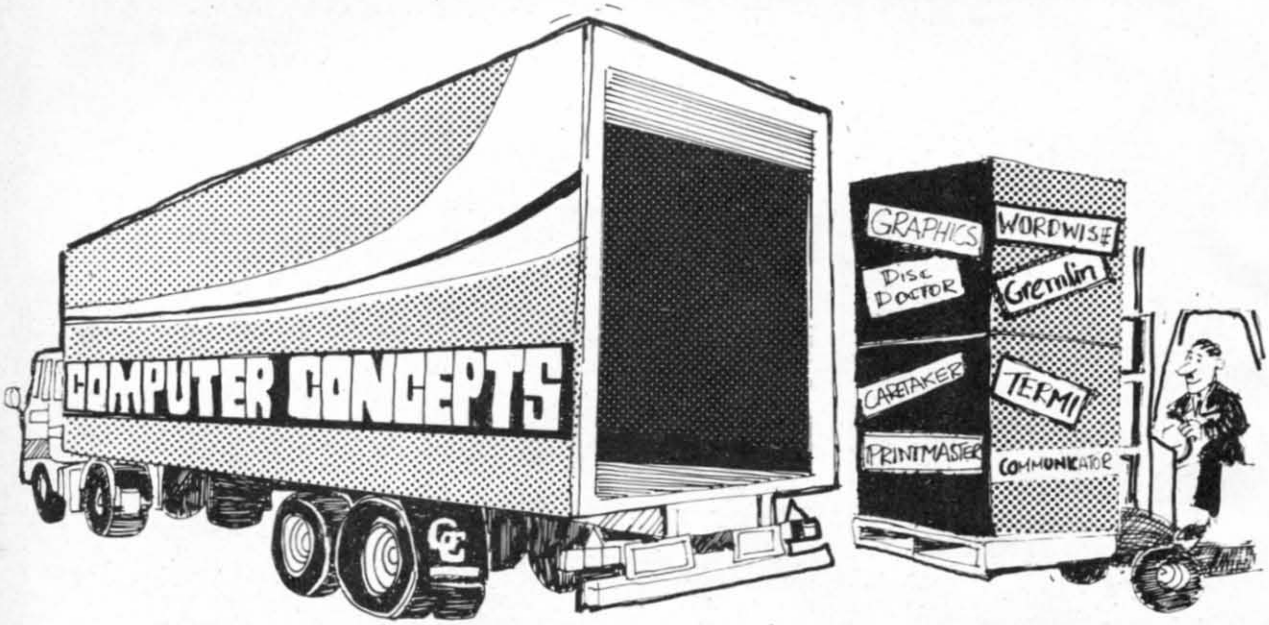
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### Part 18 of MIKE BIBBY's introduction to programming

# Use your head.. let DATA take the pain out of programming

**SO far in this series we've looked at two ways to get information, or data, into programs.**

We can use the brute force approach of assigning data directly to variables, as in:

```
10 number% = 5
```

Another way we've looked at is to teach the micro the information we want using INPUT or GET$. Here's one example:

```
10 INPUT "How many", number%
```

Let's consider a real case. Suppose we wanted to write a calendar program. We'd want the program to "know" the days of the week:

```
   10 REM PROGRAM I
   20 MODE 6
   30 DIM day$(7)
   40 FOR loop%=1 TO 7
   50 INPUT "Day of week", day$(loop%)
   60 NEXT loop%
   70 PRINT ' "The days of the week
are : - "'
   80 FOR loop% = 1 TO 7
   90 PRINT day$(loop%)
  100 NEXT loop%
```

Program I shows how we do this via our "teaching" method, inputting the data into the array *day$( )*.

As you'll see when you run it, this is mind-achingly boring. And it's irritating to have to tell the program the days of the week every time you switch on.

```
   10 REM PROGRAM II
   20 MODE 6
   30 DIM day$(7)
   40 day$(1) = "Sunday"
   50 day$(2) = "Monday"
   60 day$(3) = "Tuesday"
   70 day$(4) = "Wednesday"
   80 day$(5) = "Thursday"
   90 day$(6) = "Friday"
  100 day$(7) = "Saturday"
  110 PRINT ' "The days of the week
 are : - "'
  120 FOR loop% = 1 TO 7
  130 PRINT day$(loop%)
  140 NEXT loop%
```

Program II uses the brute force approach. Lines 40 to 100 assign each one of the variables directly.

It's a pain to type in though, isn't it?

Notice, however, that Programs I and II do exactly the same thing, though in different ways.

In programming you'll generally find there are several possible solutions to a problem. As in life, it pays to consider them all rather than rush out on the first one that occurs to you.

Take, for example, the simple assignment of variables for the day of the week.

You might, with some logic, have decided on:

```
sunday$ = "Sunday"
monday$ = "Monday"
```

and so on.

The days of the week are ordered, so a subscripted variable seems appropriate. It also makes the program more easily adaptable – *maintainable* is the jargon – if we suddenly go onto an eight day week.

A more realistic advantage of the choice of subscripted variables is that we can use it to solve our "getting data into programs" problem more elegantly.

```
   10 REM PROGRAM III
   20 MODE 6
   30 DIM day$(7)
   40 FOR loop%=1 TO 7
   50 READ day$(loop%)
   60 NEXT loop%
   70 PRINT ' "The days of the week
are : - "'
   80 FOR loop% = 1 TO 7
   90 PRINT day$(loop%)
  100 NEXT loop%
  110 DATA Sunday, Monday, Tuesday,
Wednesday, Thursday, Friday, Saturday
```

Take a look at Program III. Again it does exactly what the two previous programs did, but its way of getting data into the array *day$* is far subtler.

Lines 50 and 110 do the trick.

Let's look at line 110 in detail:

```
110 DATA Sunday, Monday, Tuesday,
Wednesday, Thursday, Friday, Saturday
```

This contains the data we want to teach the program. More technically, line 110 contains the data we want to

→

*From Page 47*

assign to the elements of the array *day$*.

So, not inappropriately, the line starts with the keyword DATA followed by the data we want, separated by commas.

What happens is that as soon as we run a program, the micro looks through it and makes a list of every item of data to be found in the DATA statements.

This list is maintained in strict order, the first item encountered being the first in the list, and so on.

So far, so good, but how does the data get into the array?

Well, lines 40 to 60 do this. Line 50 is in a loop, with *loop%* being the loop variable. So when the micro first encounters line 50 it is told to:

```
READ day$(1)
```

READ tells the micro to get an item from the list of data it has made, and assign it to the following variable.

The item of data it picks is the first one on the list that hasn't been read already.

So the first time through the loop, on encountering line 50, *day$(1)* will have *Sunday* read into it.

Next time through the loop, *loop%* will have the value 2, so *day$(2)* will have *Monday* read into it. Remember, the micro picks the first *unread* item of data.

It's not hard to see that this will continue until all the seven days have been read in. I think you'll agree, it's a much neater solution to our problem.

Lines 70 to 100 then print out the days of the week for us and the program ends.

You're perhaps thinking that line 110 might play some part when the program drops through into it from line 100.

However, it's already had its day, being read at the beginning of the program, and so plays no further part.

When you think about it, this means that the DATA statements can appear anywhere in a program.

Try deleting line 110 and re-entering it as another line – say line 35. As you'll see, the position of the DATA statement in the program makes no difference. Careful use of the Copy key will save a lot of work here.

While you're at it, try leaving, say, Saturday off the DATA statement so that when the program tries to read *day$(7)*, it has no data in the list for it. Observe and take note of the resultant error message.

When the micro's busy making up its list it ignores any spaces in front or behind items of data.

If you want a word to be preceded by, say, three spaces, you can force the micro to accept the spaces by putting the item, including spaces, in quotes. For example:

```
1000 DATA "   word","   space"
```

The micro will omit the quotes when it's making up its list of data, in much the same way that it omits them in:

```
A$ = "Test"
PRINT A$
```

The above results in the word Test appearing on the screen, not "Test".

```
10 REM PROGRAM IV
20 MODE 6
30 FOR loop% = 1 TO 9
40 READ data$
50 PRINT data$
60 NEXT loop%
70 DATA first,second,third
80 DATA   first,   second,   third
90 DATA"   first","   second","
third"
```

Running Program IV and thinking about the results should make things clearer.

Items in DATA statements don't have to be strings, though. They can just as easily be numbers. You must, however, make sure that numbers are read into numeric variables, and strings into string variables.

The fact that we separate items in data strings with commas can make life a little awkward, especially with numbers. 100,000 may mean one hundred thousand to us, but in a DATA statement it's two separate items, 100 and 000.

If you really insist on those commas, you have to put the thing in quotes, and treat it as a string.

You may be wondering how the micro keeps track of the next item of data to be read.

It does this by keeping a pointer – its own sort of variable.

One way to think of it is that the pointer holds the number of the item in the list that is the next to be read.

Once that data item has been read, it then increases the pointer by one, so that it points to the next free item on the list. Of course, at the beginning of the program, the pointer would be pointing to the first piece of data.

Now you can fiddle with this pointer and, by making it point to various parts of the list, the micro can read items of data it has already read. This means you can read more items of data than you've got.

The important keyword here is RESTORE. In Program V line 80 holds the magic word.

Whenever the micro encounters RESTORE, it changes the pointer so that it points to the beginning of the list of data items.

The effect is that the micro will begin reading from the head of the list again. Sometimes this comes in handy – especially when it saves you typing in lists of data twice.

The main part of Program V is an infinite REPEAT ... UNTIL loop.

First time through, line 50 reads *over* into *data$(1)* and *and* into *data$(2)*. Notice, you can READ more than one item at a time, by separating the receiving variables with commas.

Lines 60 and 70 then print them out. Line 80 RESTOREs the data pointer to the beginning of the data list.

This means that when we are forced to do the loop again by line 90, line 60 has some data to read – *over* and *and* once again.

Thus the program will continue to print out over and over and over.

```
 10 REM PROGRAM V
 20 MODE 6
 30 DIM data$(2)
 40 REPEAT
 50 READ data$(1),data$(2)
 60 PRINT data$(1)
 70 PRINT data$(2)
 80 RESTORE
 90 UNTIL FALSE
100 DATA over,and
```

Incidentally, RESTORE makes the micro start at the beginning of the data list whether it has reached the end of the list or not. To prove this, change line 100 to:

```
100 DATA over,and,extra
```

As you'll find, *extra* is never read.

*That's all for this month. Next month it's random numbers and how procedures can help you write better programs.*

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# Extra colours for your BBC Micro

### By KEVIN EDWARDS

**THE BBC Micro in Mode 0 offers high resolution graphics but only allows the use of two colours.**

Each colour can be changed to one of the eight available on the BBC – not counting flashing colours – by using the VDU 19 command, but still only two colours are allowed on the screen at any one time.

When a colour is changed, using the VDU19 command, the operating system updates the colour register as soon as the command is issued.

This can produce a rather flickering display if the command is repeated over and over again in close succession.

There are ways around this, however. Every fiftieth of a second the picture displayed on the screen is updated, or refreshed.

If the operating system itself waited for the next "vertical sync" – when the screen display is refreshed – the display would not flicker since the colour swop would occur at the changeover.

The problem with doing this as part of the standard OS is that the speed of program execution would be slowed, since the display is refreshed only every fiftieth of a second. The program would come to a stop at every VDU 19, waiting for the next sync.

However if you could change the colour registers at regular intervals as the screen is updated you have the advantage of being able to display several colours on the screen at the "same" time, even in a two colour mode.

In Program I, we set out to display eight bands of colour across the screen in Mode 0.

The main problem with this is to know when the vertical sync occurs and when to change the colour register.

Now the vertical sync can be trapped by intercepting event number four. Once this event has occurred a timer must be set up which will cause an interrupt at regular intervals, during which the colour register can be changed.

This will produce blocks of the chosen colour on the screen, though the timing has to be fairly accurate.

As the time between each screen refresh is one fiftieth of a second the only timer capable of such short accurate timing is the 6522 user VIA.

This timer operates a count down process at 1MHz, and is therefore well suited for the problem.

The VIA actually consists of two timers, T1 and T2. We shall be using T2 as its operation is easier to understand.

We must enter a start time into T2 and then trap the interrupt generated when the counter has decremented to zero. At this moment we change the colour being displayed and then initiate the next timed countdown until the eight colours we require have been displayed.

T2 consists of a low and high order counter. When the high order counter is loaded the timer begins to decrement at 1MHz.

Before the timer can be used we must select the timed interrupt mode and enable T2 to generate interrupts when it times out.

After this we just load in the low and high order counter and on doing so the timer will begin decrementing. When the eight colour blocks have been displayed we must disable any further T2 interrupts.

The interrupt generated by T2 passes through IRQ2V at locations &206 and &207. To check that the interrupt generated is by T2, we must check that bit five of location &FE6D is set. This bit is set only when T2 has timed out.

To do this, we change IRQ2V to point to a short routine which checks if this is true. Next we allow the interrupt to be handled back to the operating system.

The vertical sync is trapped by altering the event vector and enabling event four, which occurs at each vertical sync.

When this event has occurred we initiate the timer to generate interrupts at regular intervals, producing equal sized bars of colour on the screen.

The only problem is that vertical sync occurs when the electron beam is on its re-trace period. Therefore the first part of the timing is done during the re-trace, resulting in the top band being smaller than the others.

The colour register, or palette, is a 64 bit RAM located in the video ULA. This defines the relationship between the logical and actual colours displayed on the screen.

By altering this palette we can change the colours displayed on the screen. The palette is located at location &FE21 and consists of two nibbles.

The most significant nibble is the logical colour register and the lower nibble is the actual colour register. By altering these in the correct order we can reprogram any of the colours displayed on the screen.

Changing the colour register in any of the two and four coloured modes is rather complex. After changing one logical colour, the other logical colours must also be reprogrammed to their previous "actual" colour.

Program I shows all this in practice. When run, the eight colour blocks will be displayed on the screen. The *FX14,4 command at the end of the program enables event number four.

To disable event four, you enter *FX13,4. Entering VDU20 will then restore the colours to normal. The same effect is produced in any mode other than Mode 7 – try it and see!

The colour bars appear to shift slightly. This is owing to higher priority interrupt passing through IRQV1 being serviced first. It means that the routine has to wait until the more important interrupt has been serviced before it can update the colour register.

A word of warning. The program alters the interrupt vector. Therefore running it twice without restoring the old vector's value will cause the computer to crash.

For this reason you can see it is advisable to save the program before running it in case anything has been entered incorrectly.

The original vector table can be restored simply by pressing Break then typing OLD to retrieve the program.

→

*From Page 51*

```
   10 REM EXTRA COLOURS
   20 REM Requires 6522 User VIA
   30 REM By Kevin Edwards
   40 REM (c) Micro User
   50 FORL=0TO2STEP2:P%=&900
   60 [OPTL
   70 .Change_irq2v_vector SEI\  Disa
ble interrupts while changing vector
   80 LDA&206:STA&70:LDA&207:STA&71\
 Save old vector address
   90 LDA#Interruptoccurs MOD 256:STA
&206\  Change vector to point to new
routine
  100 LDA#Interruptoccurs DIV 256:STA
&207
  110 CLI:RTS\  Enable interrupts and
 return back to BASIC
  120 .Interruptoccurs PHA:TXA:PHA\
Save A and X on stack
  130 LDA&FE6D:AND#32:BEQExit\  Check
 if T2 has caused interrupt
  140 .Label1 DEC&74:LDA&74:AND#7:STA
&72\  If so then update colour regist
er
  150 LDA#0:STA&73:CLC:ADC&72:STA&FE2
1
  160 LDX#7
  170 .Label2 LDA&73:CLC:ADC#16:STA&7
3:ADC&72:STA&FE21\  Change colour reg
ister
  180 DEX:BNELabel2
  190 LDA&74:BEQExit\  Check to see i
f all 8 blocks have been displayed
  200 JSRSetup_6522:JMPExit1\  If not
 then set up timer for next block
  210 .Exit LDA#&20:STA&FE6E\  If all
 blocks have been displayed disable T
2 interrupts
  220 .Exit1 PLA:TAX:PLA:JMP(&70)\  R
estore A and X and jump back via old
interrupt vector
  230 .Setup_6522 LDA#&DF:AND&FE6B:ST
A&FE6B\  Select timed interrupts for
T2
  240 LDA#&A0:STA&FE6E\  Enable T2 in
terrupts
  250 LDA#0:STA&FE68:LDA#7:STA&FE69:R
TS\  Load countdown time into T2 coun
ters, low then high order
  260 .If_an_event_occurs CMP#4:BNEEn
d\  Check to see that event is a vert
ical sync
  270 JSRSetup_6522:LDA#8:STA&74\  If
 it is then set up timer and set numb
er of blocks to be displayed to 8
  280 .End RTS\ Return back to event
handling routine
  290 ]NEXT
  300 CALLChange_irq2v_vector
  310 ?&220=If_an_event_occurs MOD256
  320 ?&221=If_an_event_occurs DIV256
  330 ?&74=0
  340 MODE0:FORL%=1TO30STEP3:VDU31,10
,L%:PRINT"This is in mode 0  ........
.":NEXT
  350 *FX14,4
  360 END
```

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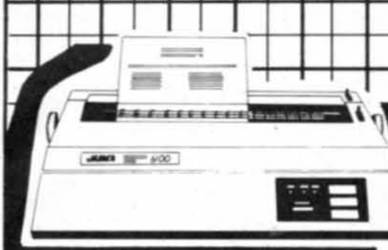

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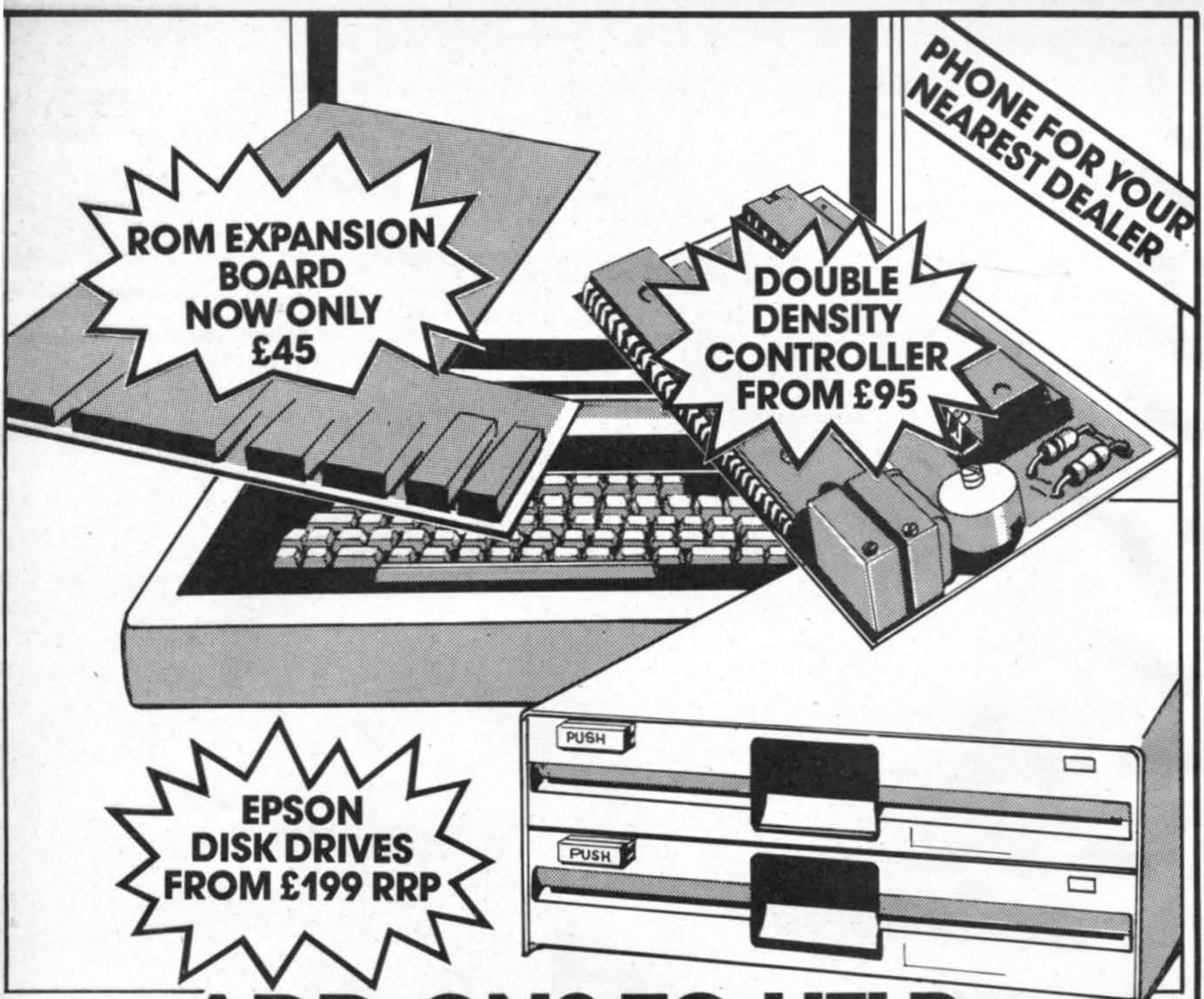
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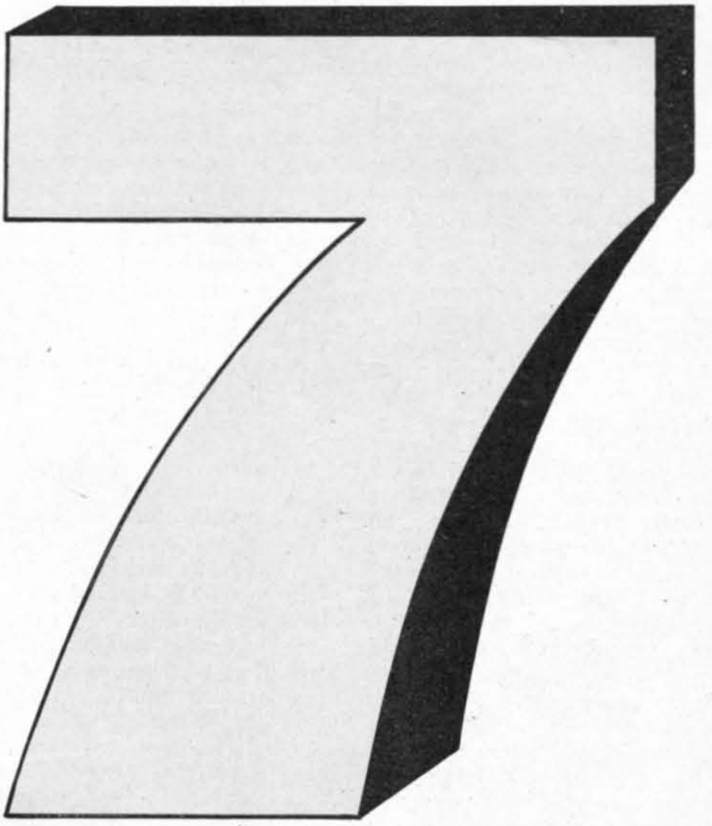

## Seven Toolkit ROMs for the BBC Micro compared by MIKE MAHON

**IN comparison to many versions of Basic having around 50 or so available commands, Acorn's 16k BBC Basic ROM presents a superb superset of the language. Together with the facilities offered by the 16k machine operating system, the BBC Micro certainly has an extensive command set.**

In all there are about 120 keywords in BBC Basic plus around a dozen operating system *commands (with a possible 18 more if a DFS is installed), 31 VDU codes, three indirection operators and 156 other *FX CALLS.

Why on earth should anyone want even more programming commands?

When developing programs in Basic the writer is often in need of information at different stages of the program concerning memory usage, variables used and their contents, states of the function keys, character definitions, filing systems in use, and so on.

The programmer may also want easily to edit parts of the program, altering lines or variable names and subsequently removing much of the spaces and comments used in the developmental stages.

It may also be necessary to join separate programs or routines together or try out the program at various places in memory.

Furthermore the current status of buffers, sideways ROMs or peripheral devices and invoked OS calls may need to be assessed without getting involved in machine code.

This review therefore concerns a number of chips which are primarily collections of Basic programming aids for the BBC Micro. Some also have additional features such as extended graphic commands or machine code monitors. The major facilities are listed in Table I and explained below, followed by a few comments on each chip.

***Memory usage:*** A very useful facility which should provide information on the current status of memory, for example program length, memory used by variables, amount of free memory and reserved memory and the location of PAGE, LOMEM, HIMEM, TOP, VARTOP.

I use this sort of facility regularly during program development and was surprised to see it available on only four of the chips.

This feature was almost fully implemented on ToolkitB, Caretaker and ToolkitD and poor on Addcomm, though the latter did give its limited information in both decimal and hexadecimal and gave the space used by variables without the user having to resort to subsequent calculations.

ToolkitD included the range occupied by the program, variables, free RAM and also any space reserved by the user. (Note that the space reserved for variables is only known by any of these chips after a program has been run.)

Without doubt the best feature in this area was *HELP INFO on ToolkitB. This offered the above type of information as with *FREE but additional information on the current status of @%, LISTO, WIDTH, error messages and more than half a dozen of the low value *FX commands – an extremely thoughtful facility.

***Function keys editor:*** Although programming the user definable function keys on the BBC is relatively easy, displaying their contents and editing them is cumbersome.

A utility to display their contents, or the contents of a selected key, to edit them, clear them and also indicate how much room is left in their area in PAGE &B00 would be useful. An optional preset function key set of commonly used routines would also be welcome.

Again, only four of the ROMs supplied function key commands, and these were rather limited allowing only visualisation and editing of their contents. Caretaker was unique and useful in allowing for the direct saving and loading of function key definitions, but unfortunately had none of the other facilities mentioned above.

***Renumber/move lines:*** BBC Basic

→

*From Page 55*

already has a renumber command – not present in most other Basics – which allows whole programs to be renumbered after specifying a starting line number and the desired increment.

This facility intelligently sorts out the GOTO line number values as well. However it is often desirable during program development to renumber only part of a program – for example, to insert extra lines – while keeping the already well ordered remainder intact.

It is also sometimes necessary to move whole sections of a program to regions with different line numbers – such as to move whole procedures within a program – without the labour of editing using the copy key.

The first of these facilities, partial renumbering, was available on four of the ROMs with varying degrees of implementation.

The second feature, block move, was only present on two of these and also on ToolkitD. The *RENUMBER command on Caretaker was fully implemented in carrying out both of these actions. In my opinion both facilities are an essential part of a Basic programmer's aid.

***Find and replace:*** While coding a Basic program it is easy to forget which variable names have been used or where they appear within a program. The programmer, or user trying to follow someone else's program, may wish to seek out all occurrences of, or lines containing, a particular string or Basic keyword.

Furthermore, when debugging a program it is often found that variations in the spelling of a variable or procedure name are the cause of much trouble and need to be readily amended. Also the final versions of programs – are there such things? – may require variable names or certain strings to be altered or replaced. This latter requirement may help in reducing the length of a program to save valuable memory.

***Toolkit*** (Beebugsoft)

*This is an excellent Basic programming aid with easy to use, and easy to remember, commands and good documentation. Its best feature without doubt is its very informative *H.INFO command, though its menu of "find" utilities was also very good. There are some areas for improvement, especially in its cross-reference and variable dump features.*

*Other useful utilities offered on this chip are a memory dump, screen save and Commodore style screen editor.*

***Addcomm*** (Vine Micros)

*This was not really up to the mark as a first division toolkit chip. A number of features were either missing or poorly implemented. However its forte was the wide range of new graphics commands and Logo like statements included on a chip, along with programming aids.*

*Overall, this chip still represents good value for money. (See more detailed review on Page 140.)*

The fundamental importance of this facility is emphasised by its inclusion on all seven utility chips. The commands relevant to these requirements are related to the words FIND, SEARCH, REPLACE, EXCHANGE and CHANGE.

The ideal utility would detect any type of string, variable name or keyword anywhere within a program or selected part thereof and would include a wildcard option for misspellings. Similarly, the exchange facility should also offer a selective or global replacement option.

The options available on the seven chips reviewed here varied enormously. Strings and variable names could be located and replaced with all the chips.

Basic keywords, however, could also be located with all ROMs, but were not replaceable with Toolstar or Molitool. In addition, locating Basic keywords with Caretaker and Aids II was fussy as the numeric tokens or complex codes were needed.

On Addcomm, Toolstar, Molitool and ToolkitD you simply type in the Basic keyword. On ToolkitB it is preceded by the £ character.

All the chips except Molitool and ToolkitD offered a wildcard facility in the search string, and this was particularly extensive on Caretaker.

When searched strings, etc, had been located, the utilities responded either by listing the respective line number only (Molitool, Caretaker), by listing the lines and contents (ToolkitD, Caretaker) or by listing the lines and highlighting the particular string (ToolkitB, Addcomm, Toolstar, Aids II) – the latter option being the most useful.

The utilities also varied somewhat in specifying the amount of the program which could be searched or replaced from global to selective range or individual lines or a mixture of each.

The replace feature was most versatile roughly in the order Addcomm, Aids II, Caretaker and Toolstar, where individual lines could be viewed before deciding whether to replace or not. The latter option was not readily available on the other three chips.

***Cross reference and variable dumps:*** A completely implemented cross reference utility would list against every variable and every keyword and every reference to a line number within a program, the line number at which they occurred.

None of the chips had such a utility, though Molitool was nearest with its *VLIST command which cross referenced all variables within a program, thus saving repetitive use of the FIND utility.

***Caretaker*** (Computer Concepts)

*Another excellent example of a Basic toolkit ROM, certainly first division stuff. A number of features are better implemented than on Beebugsoft's Toolkit though they are slightly more difficult to use and remember. Reference to the well written manual, however, leaves no problems in getting the commands to work.*

*This chip also has facilities for switching the cursor on or off, setting tabstops and single key entry of keywords (an Electron emulator!). I still wonder why there is no verify command though.*

ToolkitB made a slight indent in this way with its commands for listing the lines at which functions and procedures occurred and Caretaker was able to show which procedures had been used.

One of the essential needs while debugging a program is to know the current contents of variables used. Thus one would expect any programmer's aid worth its salt to have a variable dump utility for this purpose.

Ideally it should be possible to select all or any type of variable – real, integer, string or array – and list its contents following a full or partial program run.

Molitool certainly came out best with this facility, as it was the only utility capable of listing the contents of arrays rather than just their dimensions. Its only limitation was the requirement to dump each type of variable separately. There was no "dump all variables" command.

This limitation was also present on ToolkitB, though it did, like Caretaker, produce the numeric variables contents in both decimal and hexadecimal format. Caretaker, however, allowed for the dump of all variables or a selected type.

In contrast, only the "dump all variables" option was available on Aids II. The variable dump was most limited on Addcomm, which merely listed the variables currently used and not their contents.

I would not buy any chip solely as a Basic programming aid unless it had a decent variable dump.

***Shorten program:*** Free memory in the BBC Micro is usually scarce. Programs are often required to be as short as possible just to fit in the space available, let alone run.

Furthermore, it may be necessary to reduce the length of a program which worked in a cassette-based machine in order to run it on one fitted with a memory-gobbling upgrade such as disc, econet or teletext. Another reason for reducing program length is to make it run more quickly.

Editing out each unwanted space or REM statement and creating multistatement lines is tedious. Therefore a shorten program facility is definitely in the class "every toolkit should have one".

Four of the seven toolkits tested were able to remove unnecessary spaces and/or REM statements. In addition, Addcomm could remove just REM statements.

Only Addcomm, however, allowed selection of the range to be compacted. Unfortunately two chips, ToolkitB and Addcomm, were careless in removing REM lines referenced by GOTO statements.

Only Addcomm and Caretaker had the extra facility of creating multistatement lines to save memory.

Undoubted Caretaker was the most complete program shortener. It is just a pity it doesn't tell you how much memory has been saved when it has done its job.

***Lengthen program:*** Having gone to all the trouble to shorten a program in order to save on memory, the program may have become rather unreadable – especially if many multistatement lines are present. A facility to add extra spaces and disarticulate multistatement lines is therefore quite helpful, particularly for listings.

***Toolstar*** (Pace)

*Both Basic and machine code programming aids are implemented on this chip. Unfortunately with regard to this review the latter far outweigh the former in capabilities. As a Basic utility chip it is not adequate.*

*It did, however, have a useful *RESET command and some disc editing/formatting features. Also *CONV allows conversion between decimal, hexadecimal and binary.*

*I cannot leave this one without mentioning the manual. It is long (127 pages), comprehensive and full of useful information. The most annoying feature of this utility was that blinking purple star!*

All the chips except ToolkitB had some facility for improving legibility. Caretaker, Aids II and ToolkitD allowed whole or selected parts of a program to be listed on screen or to the printer with multistatement lines taken apart, and, in the case of the latter two, with extra screen colours and indents to highlight features.

This process was limited to a specific line on Addcomm, though it could be combined with the find utility to list a whole program in this way.

Molitool did not break multistatement lines, but did add spaces to give extra clarity in listings. Toolstar's *FLIST added useful information to the listing for machine code programmers in putting line memory locations in the display.

Aids II and ToolkitD were slightly more adventurous with this facility than Caretaker, though the latter was slightly easier to use.

***Aids II*** (Softsmith)

*A different approach to the others, as most commands are menu-driven. Although many of the Basic programming aids are implemented, and often quite well, too many of the really useful options, such as memory information, function key editor, program shorten and verify, are missing.*

*These deficiencies and the difficult to use manual put this in my second division class.*

*Like Toolstar, this chip does offer the machine code programmer a memory dump and disassembler. Aids II also has the option to set each key to bleep when pressed.*

***Verify a saved program:*** BBC Basic is unusual in not having a verify command to check that a saved program will load properly and is a perfect replica of the original still in memory. However only three of the toolkits have rectified this omission.

ToolkitD's version was the weakest and merely responded with "verified" or "verification failure". ToolkitB either "file verified" or "failed at ... (hexadecimal address)" following which the program could be checked using the memory editor.

If a file did not verify then Addcomm gave the most useful information in listing the offending Basic line, highlighting the corrupted code and showing the memory location in decimal and hexadecimal. There was a feeling of insecurity using Addcomm as no message was given if the program verified successfully, leaving the user wondering if any checking had been done at all.

***Repair a bad program:*** Surely there can be no user of the BBC Micro who hasn't cursed at the inevitable "Bad program" error message following loading, altering, OLDing or rerunning a Basic or machine code program.

Certainly the writers of these toolkits must have suffered this problem frequently, as a utility to repair a bad program was included on all the chips tested.

All worked adequately though it was difficult to test every possible program corruption against each chip.

***Move a program:*** The ability to move the whole of a Basic program to a new position in memory and reset PAGE is available on five of the toolkits.

This facility is most useful when a program requiring lots of memory has been loaded from disc or telesoft and needs to be downloaded to &E00 in order to run.

All the five toolkits were able to move a Basic program up or down in memory, reset PAGE and facilitate a run without further modifications.

Toolstar's *MCOPY was the most difficult to use as it required knowledge of the program's start and end addresses in hexadecimal.

The *BSHIFT command of ToolkitD was the most flexible as whole Basic programs or specified chunks of

→

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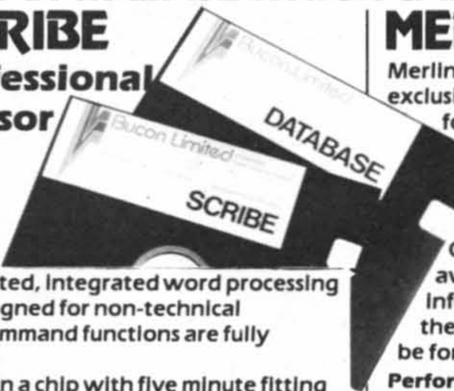

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- Wild card
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**Report Writing**

- Database will integrate with Merlin Scribe word processor
- Format printer output with simple forms editor
- High powered forms layout & editing using Scribe (alls. rt. justify)
- Arithmetic calculations & accumulators
- Conditional report writing
- Semi programming facility for forms & report generation

**Other Facilities**

- Mail merge using Scribe • Conditional mail merge
- Automatic reformating of lines • Capable of conditional transfer of information between databases.

Database comes in chip with manual, simple fitting instructions & systems disc. Also planned is the production of Database integrated with the Merlin Scribe word processor in a single chip although the database is designed to integrate easily with Scribe in a separate chip.

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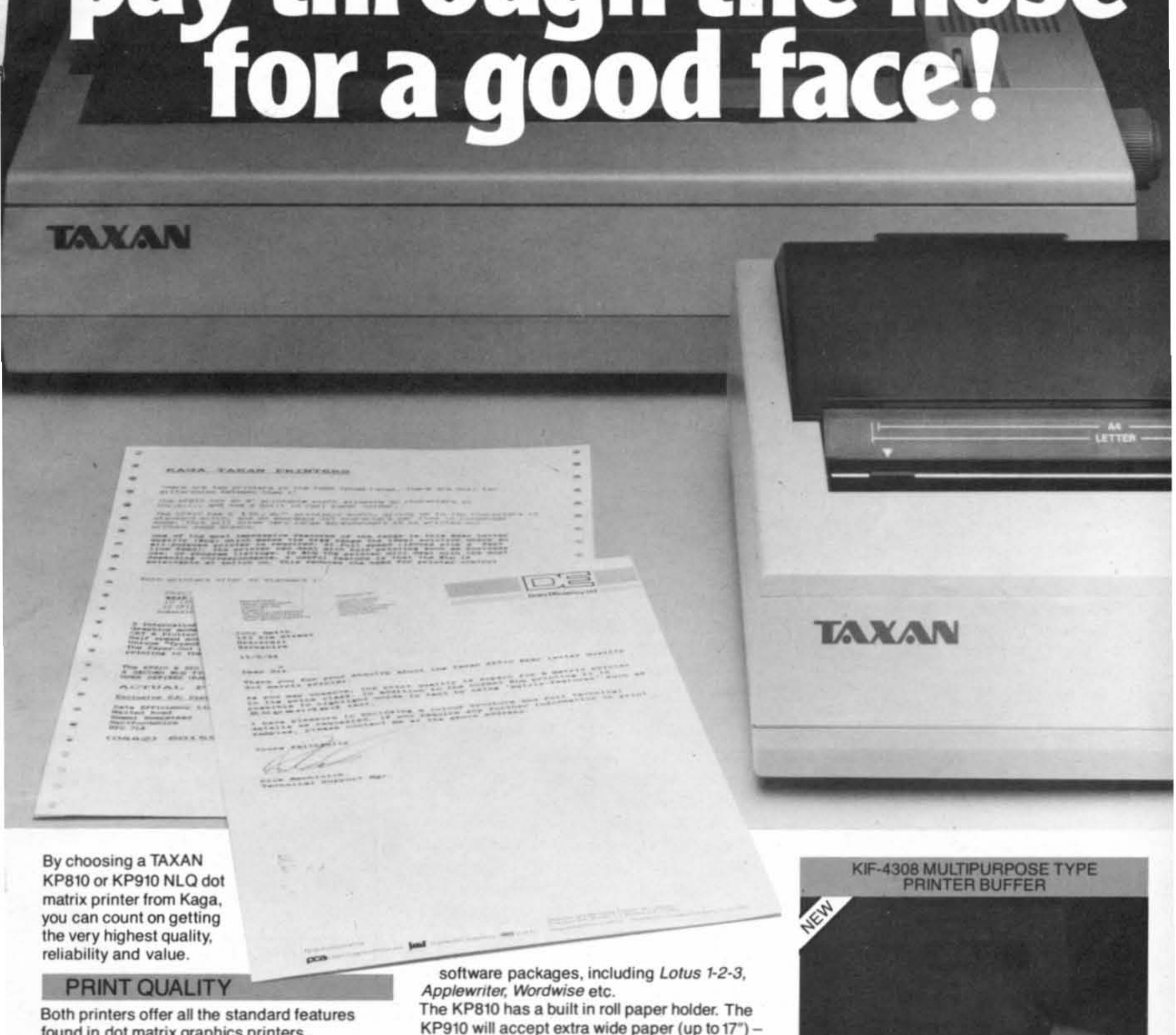

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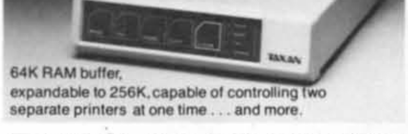

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From Page 57

machine code could be moved around in memory.

*Merge programs:* Finally, in the main list of facilities compared, is an alternative to BBC Basic's *SPOOL command for putting program parts together.

In practice this facility is mostly used to append already saved procedures to a program in memory. This feature was poorly implemented on Aids II and was for appending one program already in memory to another.

> ***Molitool*** (Molimerx)
>
> *Compared to the others this chip seems rather expensive in view of its sparse command set and the poor implementation of some of them.*
>
> *Even so it is almost worth having just for the brilliant, though not perfect, variable dump and cross referencer. Certainly the other toolkit writers should take good note of the standard to attain in this area.*
>
> *Molitool also offers a useful screen display of all the current character definitions (*CHAR), another facility that could become standard on toolkits.*
>
> *Molitool's manual was the only one deviating from the now usual A5 format. There is also room for improvement in the clarity of the documentation.*

On ToolkitB *MERGE did the job adequately and informed the user when similarly numbered lines had been overwritten. The same command on Caretaker and ToolkitD was even more unfriendly as these ROMs did the overwriting or even subsequent renumbering without telling the user.

The latter two, however, did have the added bonus of being able to insert appended programs from a file into the main program even if line numbers were similar. The new program could then be renumbered.

### *Conclusions*

A variety of useful and often well thought out facilities are available on the seven ROMs tested.

Overall, the range and implementation of commands on Beebugsoft's Toolkit and Computer Concept's Caretaker probably makes them the best of the bunch.

These chips seem to provide no incompatibility problems when used alongside various other ROMs, including the Watford DFS.

Their use of prefixes – B for Beebugsoft, C for Computer Concepts and also T for Molitool – help to discourage command clashes, but it may have been even safer to provide a function to shut off unwanted ROMs from the toolkit.

Further improvement, particularly in the areas of a full HELP (error checking) facility, a complete cross referencer, and full variable and array dumps is desirable.

None of the chips offer much information on the status of peripheral devices such as disc drives, printers or speech processors, nor on visualisation of extraneous end of line spaces. I look forward very much to updated versions which rectify the deficiencies, improve implementation and also provide complete tube compatibility.

Finally, what about a decent TRACE/STEP facility to supplement the awful BBC version, bringing it up to the standard of the Commodore Pet Toolkit which had this way back in 1979?

Perhaps the first 16k Basic (plus machine code?) programmer's toolkit for the BBC may achieve all this first time around!

> ***Toolkit*** (Dataware)
>
> *A novel, but eventually annoying, feature of this chip is its security aspect. From switch on, between the beep and the bop sound Toolkit asks for a password. If you get it wrong after three tries the owner's name and address appears on the screen, the keyboard is locked and an alarm sounds. (Fortunately you can buy this chip without the security feature.)*
>
> *After getting through this I found Dataware offered a rather unusual choice of commands for a Basic programming aid. Not present were function key editing, variable dumps, cross referencer and clever renumbering, but included were keyboard lockouts, CRC checks and an archival disc to tape and vice versa loader.*
>
> *One facility implemented on this chip which every other should have had was the proper error reporting aid which marks the character(s) at fault. In addition the documentation was quite good.*

| ROM | Toolkit B |
|---|---|
| Version | 1.21 |
| Code length | 8k |
| Supplier | Beebugsoft |
| Cost | £27 |
| Signature presence | – |
| Memory used | – |
| Documentation | 32 pages |
| Prefix | B |
| Commands | 27 |
| Memory usage | *FREE<br>*H.INFO<br>++++ |
| Function keys editor | – |
| Renumber lines | *RENUMBER<br>+++ |
| Move lines | *UTIL3<br>++ |
| Find | *UTIL1 range<br>++++ |
| Replace | *UTIL2 range<br>++(+) |
| Cross reference | *UTIL4<br>+ |
| Variable dump | *UTIL5,6,7,8<br>++(+) |
| Shorten | *PACK S,R<br>++ |
| Lengthen/ clear read | –<br>– |
| Verify program | *CHECK<br>++ |
| Repair program | *RECOVER<br>+++ |
| Move program | *MOVE<br>+++ |
| Merge programs | *MERGE<br>++ |
| Other commands | *MEMORY<br>*CLEAR<br>*EDIT<br>*NEW<br>*OLD<br>*ON/OFF<br>*REPORT<br>*ONF<br>*SCREEN |

| Addcomm | Caretaker | Toolstar | Aids II | Molitool | Toolkit D |
|---|---|---|---|---|---|
| 1.00<br>8k<br>Vine Micros<br>£28<br>–<br>256 bytes<br>72 pages<br>–<br>21 (40) | 1.00<br>8k<br>Computer Concepts<br>£33.35<br>yes<br>–<br>30 pages<br>C<br>18 | 1.77<br>6.5k<br>Pace<br>£34<br>yes<br>–<br>127 pages<br>–<br>12 (23) | 2.10<br>8k<br>Softsmith<br>£25<br>–<br>–<br>24 pages<br>–<br>11 | 0.21<br>8k<br>Molimerx<br>£33.35<br>–<br>–<br>9 pages<br>T<br>11 | 1.02<br>8k<br>Dataware<br>£22<br>yes<br>–<br>30 pages<br>–<br>20 |
| MEM<br>+ | *STATUS<br>+++ | – | – | – | *BMEM<br>+++ |
| FKEYS<br>+ | *KEYSAVE<br>*KEYLOAD<br>+ | *FKEYn<br>++ | – | *FNKEY<br>++ | – |
| –<br>– | *RENUMBER<br>++++ | *OPEN<br>+<br>– | *LREN<br>+++<br>*LMOVE<br>+++ | –<br>– | –<br>*BMOVE<br>++ |
| FIND range<br>++++<br>GREPL range<br>SREPL range<br>++++ | *EXCHANGE<br>+++(+) | *FIND<br>+++<br>*REPLACE<br>++ | *AIDS S<br>+++ | *FIND<br>++<br>*CHANGE range<br>+ | *BFIND range<br>++(+)<br>*BSR range<br>+(+) |
| –<br>LVAR range<br>+ | *LVAR P<br>+<br>*LVAR F.I.S.A<br>++(+) | –<br>– | –<br>*AIDS V<br>++(+) | *VLIST range<br>+++(+)<br>*VAL %, $, ()<br>+++(+) | –<br>– |
| COMPACT range<br>KILLREM range<br>++ | *SQUASH S,R,M<br>+++ | – | – | *STRIP R.S.<br>++ | *BPACK 1,2,3<br>++ |
| –<br>LLIST range<br>+(+) | *EXPAND range<br>+++ | –<br>*FLIST<br>+ | –<br>*AIDS L<br>*LLIST<br>+++(+) | *PAD<br>–<br>+ | –<br>*BLIST range<br>*BLIM<br>+++ |
| VERIFY<br>+++ | – | – | – | – | *BVERIFY<br>+ |
| GOODPROG<br>+++ | *RETRIEVE<br>+++ | *FIX<br>+++ | (*AIDS S)<br>+++ | *MEND<br>*MEND+<br>+++ | *BMEND<br>+++ |
| – | *MOVE<br>+++ | *MCOPY<br>++ | – | *MOVE<br>+++ | *BSHIFT<br>++++ |
| – | *MERGE<br>*INSERT<br>++(+) | – | *LMERGE<br>+ | – | *BMERGE<br>*BOVERLAY<br>++(+) |
| ADDCOMM<br>CHAR<br>SETWIN/WIN<br>LGOTO<br>POPFOR/GOS/REP<br>SORT<br>8 LOGO commands<br>11 graphic commands | *CURSOR<br>*PARTSAVE<br>*TABSTOPS<br>*NO TAB<br>*SINGLEKEY<br>*NORMALKEY | *CONV<br>*RESET<br>*MDUMP<br>*MROM<br>*MCRC<br>*EXTEND<br>4 disc commands<br>6 machine code commands | *AIDS D<br>*AIDS M<br>*AIDS B<br>*AIDS P | *CHARS | *ARCHIVE<br>*RETRIEVE<br>*BCRC<br>*BEQUIV<br>*LOCK<br>*UNLOCK<br>*BREPORT<br>*BROFF |

*A 'B' or 'D' suffix has been added to Toolkit throughout the text and in the table to distinguish the two chips. Facilities are scored as + (poor), ++ (satisfactory), +++ (good) or ++++ (very good). ( ) indicate half marks. – indicates not available.*

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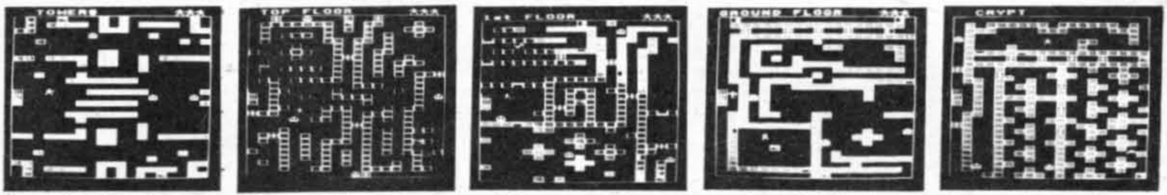

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These two packages give an adult or older child a means to take a younger child through a series of simple game type tasks to enforce ideas. The emphasis is on learning through fun. Topics covered include subtraction, addition, recognition, colour, shapes, sizes, sounds/notes, co-ordination, distances, estimates, directions.

**EARLY YEARS 1**

A) MICKEY THE MONKEY and his apple tree make subtraction fun.
B) COLOUR BLOCKS bring sizes and colour into perspective.
C) MERRY MUSIC turns the keyboard into a musical keyboard.
D) FUNNY FACES presents a line up, which one is the suspect?
E) FRED THE FROG needs co-ordinated help to get across the pond.

**EARLY YEARS 2**

A) THE POND seems very active today
B) SPEED is required to keep the cake on the conveyor belt.
C) DIRECTIONS seem to be needed by everyone in Orion village.
D) ORDER the blocks.
E) SID THE SPIDER needs some help to get out of the maze.

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# ALTERNATIVE INPUT

**ROBIN NIXON discusses ways to help disabled people communicate with the micro**

**MANY readers will be typing in some of the listings printed in this issue of *The Micro User*.**

Disregarding typing mistakes, this is the simplest, quickest and most effective means of accessing a micro we have yet invented.

The keyboard is so standard to most people that if it were not there it would be sorely missed.

It may seem that I am stating the obvious, but there is a group of people for whom the keyboard is and will be – perhaps forever – a closed door. I am talking about the severely disabled.

There are alternative inputs now available that can be used by some disabled people, notably the mouse that is used to control Apple's Lisa and Macintosh.

There are also some forms of input that have been designed especially for the disabled which, due to their simplicity, can also be useful to able bodied people.

In attempting to overcome the communication difficulties of disabled people – many of whom are severely speech impaired – it is necessary to start by going back to the micro's natural language, binary.

Having only two states (on or off), it is ideal for someone who may have control over only one muscle and therefore can only use one switch.

There is really only one workable system for a one switch user, and that is a scanning matrix display as shown in Figure I.

On pressing and holding down one switch a cursor scans across the display at a pre-selected rate. Each column in turn will be highlighted. When the column containing the desired character is reached the switch is released.

Pressing the switch a second time and again holding it down will cause each of the characters in the column to be highlighted in turn. When the chosen character is reached the switch is released and the character entered into memory.

| | | | | | | |
|---|---|---|---|---|---|---|
| A | B | C | D | E | F | G |
| H | I | J | K | L | M | N |
| O | P | Q | R | S | T | U |
| V | W | X | Y | Z | £ | sp |
| 0 | 1 | 2 | 3 | 4 | , | del |
| 5 | 6 | 7 | 8 | 9 | . | ret |

*Sp : Space del : Delete ret : Return*

*Figure I: Alphanumeric scanning matrix display*

| Switch 1 | Switch 2 | Binary | Decimal |
|---|---|---|---|
| OFF | OFF | 00 | 0 |
| OFF | ON | 01 | 1 |
| ON | OFF | 10 | 2 |
| ON | ON | 11 | 3 |

*Figure II: The four possible states available from two switches.*

As might be expected, with each extra switch added more bits of information can be input. Using two switches you get four bits to play with. (See Figure II.)

However you normally only have two bits, rather than four, as the "all off" state, where neither switch is pressed, cannot easily be used and many two switch users can only press one switch at a time.

With many severely disabled people two is the maximum number of switches that can be used. With two switches scanning the matrix becomes easier.

The first can be used to scan across, the second to scan down and the first, pressed a second time, to "enter" the chosen character. Listing I is just such a program.

This program can be used to replace most inputs. However, in cases where other characters than those in the matrix are required, you could use the £ sign as a toggle switch between this matrix and one of your own choice.

For example, replace lines 100 and 260 and add lines 350 and 360 as shown in Listing II.

The program will now alternate between an upper and lower case matrix each time £ is selected.

Using alternative displays is a useful feature for disabled people as it means they do not have to scan through the huge number of characters of a fully comprehensive matrix.

Selecting @ is the equivalent of pressing Return.

There are many small adaptations that can be made to some programs that are useful to both keyboard and two switch users.

For example, many programs offer the user a menu of some sort. Using a procedure such as the one described above you could replace the Input command.

But a simpler means of selection between items in a menu is to highlight

```
   10 T$="":*FX11,50
   20 *FX12,50
   30 MODE7:PRINTT$:PROCINPUT(0,5):GO
TO30
  100 DEFPROCINPUT(P%,Q%):PROCSC1:T$=
"":VDU31,P%,Q%
  110 PROCSC3:IF B%=13 THENPRINT:ENDP
ROC
  120 IFB%=127ANDT$<>""THENT$=LEFT$(T
$,LEN(T$)-1):PRINTB$;:GOTO110:ELSEIFB
%=127THEN110
  130 T$=T$+B$:PRINTB$;:GOTO110
  140 DEFPROCSC1:FORV%=14TO24STEP2:VD
U31,10,V%,131:NEXT:FORXX%=0TO6:FORYY%
=0TO2:VDU31,11+XX%*2,14+YY%*2,XX%+65+
7*YY%:NEXTYY%,XX%:VDU31,11,20
  150 PRINT"V W X Y Z £ ";CHR$255:VDU
31,11,22:PRINT"0 1 2 3 4 , [":VDU31,1
```

*Listing I*

## PROCEDURES

| | |
|---|---|
| **PROCINPUT** | Called with two parameters which tell the procedure where to print the line to be input – as with PRINT TAB(X,Y). |
| **PROCSC1** | Displays the matrix on the screen. |
| **PROCSC2** | Used when scanning to place alpha blue characters in front of the characters being scanned, and alpha green after them – to keep the rest of the display the same colour. |
| **PROCSC3** | Calls PROCADVL to determine which of the two buttons is pressed (if any) and then either calls PROCSC2 to show the current column or character being scanned, or returns to PROCINPUT with a selected character. |
| **PROCADVL** | Waits until a switch is pressed and returns with AD% equal to either one or two. For people who do not have access to paddle or joystick inputs, PROCADVL will accept the keys "Z" and "X" as switches one and two. Although the BBC Micro is capable of interfacing in many ways, we chose the ADVAL (Analogue to Digital VALue) port as this seems the simplest to use. As in Figure II, ADVAL(0) AND 3 will return a value between 0 and 3. |

each of them in turn. This could be accessed by two switches – one to scan and one to select – or by the arrow keys and Return.

This also avoids the need to check whether or not an input is valid.

Programs that require the user to input the same word many times, such as adventure games, could include the most commonly used words – if not all – on the screen so that they can be quickly selected by scanning.

Mode 7 is the simplest mode to use for scanning because it is only necessary to insert one control character before the character or line to be highlighted, and sometimes a highlight cancel character afterwards. However the graphics modes can offer more flexibility.

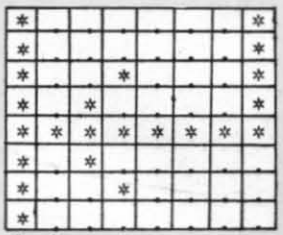
Modes 2 and 5, having only 20 columns of text, are more suitable for people with visual impairement. In all Modes except Mode 7, user defined characters can be displayed.

This would enable us to replace the @ and £ signs for chosen carriage return and alternative menu symbols.

See Figure III.

Drawing is something you may consider inaccessible to a two switch user, but this is not the case.

Using Logo or another Turtle based language, it is possible to move forwards, left, right, pick the pen up and put it down with only one keystroke, providing the angle of turn and distance have been pre-set.


**Carriage return**

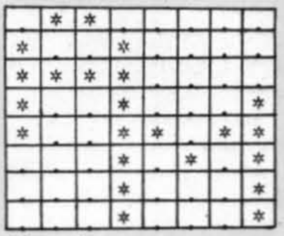

**Alternative menu**

*Figure III: Control symbols for a scanning matrix display*

In fact, with a little ingenuity, nearly all programs could allow for two switch input. Programs that have been written with an alternative input in mind are always easier to use for everyone.

I would be pleased to hear from anyone interested in writing or adapting programs for alternative input or from any disabled people who would like the catalogue of our program library.

The address to write to is: *Robin Nixon, Advisor on Computer Aids for the Disabled, COMPAID, Seven Springs Cheshire Home, Pembury Road, Tunbridge Wells, Kent TN2 4NB.*

```
1,24:PRINT"5 6 7 8 9 . @";:ENDPROC
  160 DEFPROCSC2:NN%=&7BBB+40*16+DP%*
2:FORFF%=FG1%TOFG2%STEP2:?(40*FF%+NN%
-1)=CC%:?(40*FF%+NN%+1)=131:NEXT:ENDP
ROC
  170 DEFPROCSC3
  180 FG1%=0:FG2%=10:DP%=0
  190 CC%=132:PROCSC2:PROCADVL:IFAD%=
2 GOTO220
  200 CC%=131:PROCSC2:DP%=DP%+1:IFDP%
=7:DP%=0
  210 GOTO190
  220 CC%=131:PROCSC2:VDP%=0
  230 CC%=132:FG1%=VDP%:FG2%=VDP%:PRO
CSC2:PROCADVL:IFAD%=1 GOTO260
  240 CC%=131:PROCSC2:VDP%=VDP%+2:IFV
DP%=12 PROCADVL:VDP%=0:IFAD%=1 GOTO18
0
  250 GOTO230
  260 B%=?(NN%+40*VDP%):IFB%=ASC"[" B
%=127 ELSE IFB%=ASC"@" B%=13 ELSE IFB
%=255 B%=32 ELSE IF B%=35 B%=96
  270 B$=CHR$B%:CC%=131:PROCSC2:ENDPR
OC
  280 DEFPROCADVL:QT%=0:*FX15,1


  290 AD%=ADVAL(0)AND3:IK%=INKEY(0):I
F(AD%=0 OR AD%=3) AND IK%=-1 PNT%=0:G
OTO290
  300 IFPNT%=0 PNT%=1:GOTO330
  310 Z1%=0:REPEATZ1%=Z1%+1:IF(ADVAL(
0)AND3)=0 PNT%=0:Z1%=200:QT%=1
  320 UNTILZ1%=200:IFQT%=1 GOTO290
  330 IFIK%=90 AD%=1 ELSE IF IK%=88 A
D%=2 ELSE IFIK%<>-1 GOTO290
  340 ENDPROC
```

```
  100 DEFPROCINPUT(P%,Q%):TGL%=0:PROC
SC1:T$="":VDU31,P%,Q%
  260 B%=?(NN%+40*VDP%):IFB%=ASC"[" B
%=127 ELSE IFB%=ASC"@" B%=13 ELSE IFB
%=255 B%=32 ELSE IF B%=35 TGL%=TGL%+1
:IFTGL%=1 PROCALTERNATIVE_MATRIX:VDU3
1,P%,Q%:PRINTT$;:B%=0 ELSE IFB%=35 TG
L%=0:PROCSC1:VDU31,P%,Q%:PRINTT$;:B%=
0
  350 DEFPROCALTERNATIVE_MATRIX:FORV%
=14TO24STEP2:VDU31,10,V%,131:NEXT:FOR
XX%=0TO6:FORYY%=0TO2:VDU31,11+XX%*2,1
4+YY%*2,XX%+97+7*YY%:NEXTYY%,XX%
  360 VDU31,11,20:PRINT"v w x y z £ "
;CHR$255:VDU31,11,22:PRINT"! "" # $ %
 ; [":VDU31,11,24:PRINT"& ' ( ) ? : @
";:ENDPROC
```

*Listing II*

# Challenging games spark off ideas

**Brainteasers for the BBC and Electron Computers**
*By Genevieve Ludinski*
*(Phoenix Publishing Associates)*

BRAINTEASERS
FOR THE BBC AND ELECTRON COMPUTERS
G. LUDINSKI
IQ
?
PROGRAMS TO PUZZLE AND AMUSE

THE subtitle of Brainteasers for the BBC and Electron Computers is Programs to Puzzle and Amuse, and this just about sums it up.

This book is a collection of 29 puzzling listings, each one an interesting and amusing challenge.

I must admit it made a nice change to come across a collection of games that didn't rely too heavily on my reflexes. There were no hordes of alien nasties whizzing across the screen. Just gentle, intriguing challenges.

The programs cover mazes and safe cracking to mathematical sequences and pattern sorting. I particularly liked the idea of Close Encounters of the Fourth Kind, an intergalactic game of Simon.

With 29 listings to choose from there must be something to satisfy every taste. Most of these listings aren't long, which encourages you to type them in.

At first sight they looked jumbled and cluttered but I had little difficulty entering them.

Well, no more than usual. And the games were well worth the effort of typing them in.

A nice feature is that each listing has a few paragraphs of program hints. These greatly add to the book's value.

They give explanations of techniques used in the programs and hints on how to make them easier or more difficult. I'd love to know who wants them to be harder!

Another aspect of the book is that it acts as a stimulant for your own ideas. I've never written a brainteaser game but the book sparked off lots of ideas, and it also showed me ways of writing them.

There's only one thing that I'd complain about. One of the programs I ran gave me an IQ rating. It must be wrong, I'm far more intelligent than that!

Despite that, it's an enjoyable book, far from the usual run of the mill set of games listings. If you like puzzles and you've got a BBC Micro then you'll like this book.

**Trevor Roberts**

# The basics of Basic made friendly

**The Friendly Computer Book**
*By Jonathan Inglis (BBC Publications)*

I MUST admit when I first saw the Friendly Computer Book and read the blurb on the back, I reacted unfavourably.

I was convinced it would be one of those computer books which confuses being simple with being simplistic, and explaining in easily understood terms with talking down to people. The fact that it had cartoons in it didn't help my prejudices, either.

Happily, though, when I actually got down to reading the book as opposed to reacting to it I got a very pleasant surprise. I found that it really was the friendly and simple introduction to Basic programming.

The book starts with a general introduction to the world of computing and explains some of the jargon. Nowhere does it go into things too deeply.

But what it has to say is thorough and makes sense. It gives the answers to the sort of questions that beginners have but feel might be too daft to ask.

It then goes on to cover keyboard skills and in the third chapter starts on programming. The remaining ten chapters deal with Basic programming in simple, clear terms.

New concepts are introduced gradually and logically and thoroughly explored in some delightful little programs.

The novice is painlessly lead through the early keywords (LIST, RUN and so on) through loops, decision making, arrays and simple data handling, onto simple sound, graphics and animation.

The presentation of the book is excellent. The listings are clear, and the cartoons amusing and helpful.

The "Chip's Workshop" at the end of each chapter adds a nice, friendly and educational touch to the main text. Each chapter also carries a summary of what it contains.

The only reservation that I have about the book is that as it's written to cover three micros (the BBC Micro, the RML380Z, and the Spectrum) the programs don't make much use of the more advanced structures of BBC Basic.

Still, in what is meant to be a very elementary beginners book, I can't see that that's any real fault. In fact considering it covers three micros, each with different commands, the book is amazingly easy to follow, a tribute to whoever designed it.

So, all in all, an excellent little book that I would recommend to those who find the more traditional type of textbook too daunting.

It may be a little too simple for some tastes but it's certainly one to bear in mind when buying beginners books.

It is a very friendly guide to the basics of Basic and a gentle introduction to micros for the young.

**Trevor Roberts**

# You'd have to spend over £3000 to beat our £199 Second Processor.

The BBC Micro is already one of the fastest and most powerful micros around.

But with the addition of the 6502 Second Processor, it becomes the fastest micro in its price range.

(To be fair to the opposition, their £3000+ package includes a disc drive. But a similar BBC Micro set-up with the 6502 Second Processor will cost you less than a third!)

The 6502 greatly expands the Micro's usable memory. Its 64K of RAM combines with the BBC Micro's 32K, for a total of 96K.

It is supplied with its own special version of BBC BASIC, called Hi-BASIC, which allows the maximum amount of this memory to be used for BASIC programs and variables. Other languages allow some or all of this memory to be used for programs, and many will automatically adjust themselves to make maximum use of available space.

What's more, the 6502 uses the same microprocessor as the BBC Micro, but at a much higher speed. Which means programs can run up to 50% faster.

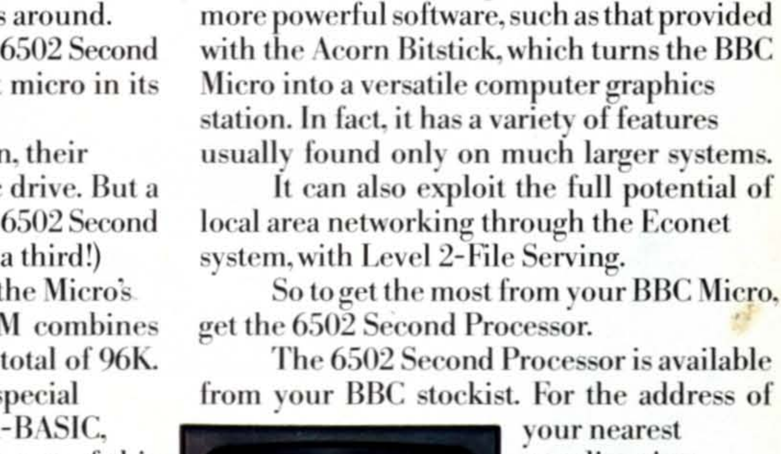
The 6502's extra power enables it to run more powerful software, such as that provided with the Acorn Bitstick, which turns the BBC Micro into a versatile computer graphics station. In fact, it has a variety of features usually found only on much larger systems.

It can also exploit the full potential of local area networking through the Econet system, with Level 2-File Serving.

So to get the most from your BBC Micro, get the 6502 Second Processor.

The 6502 Second Processor is available from your BBC stockist. For the address of your nearest supplier, ring 01-200 0200.

If you wish to order by credit card, phone 0993 79300 during office hours.



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(available seperately)

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ViewEdit: A full screen editor based on the VIEW word processor.

TRACE: A 6502 trace package for de-bugging all types of program.

PRINT: A program to produce formatted assembly listings without using MASM.

The package is provided with a 250-page manual describing all the facilities provided by the system.

Technical Specifications

The Second Processor operates at a clock rate of 3MHz. A version 1.2 MOS will need to be fitted into the BBC Micro before operating the 6502.

Integral power supply

Measurements: 205mm x 345mm

Weight: 2.1 kg

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Construction: Moulded top and bottom to match BBC Computer profile. ABS injection moulded plastic.

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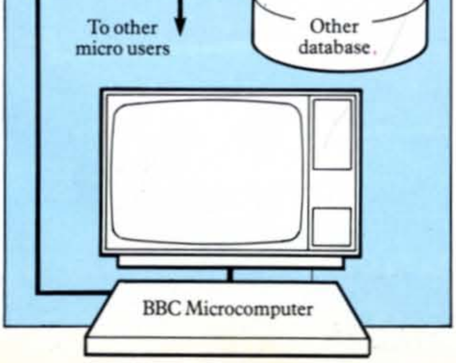

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All software is for the British Broadcasting Corporation Model B Microcomputer except where indicated. Every pack includes full documentation. Prices include VAT.

40813

# MIKE COOK'S PROBLEM PAGE

# From 40 to 80 tracks – using software commands

I RECENTLY bought a BBC Micro and a Torch disc pack. At the time of purchase I was told that the drives in the disc pack could read both 40 and 80 track discs just like switchable drives, only the number of tracks could be changed by software instead of switches.

I would dearly love to know how to do this as almost all software available for the BBC Micro is supplied on 40 track discs.

It seems to me that people who have bought 80 track drives have in some way lost out as software producers just don't want to know 80 track discs.

My second problem may seem obvious to those who know anything about sideways ROMs, but it has me baffled. When the computer is turned on it is using the second processor (Z80) and running CP/N.

When the Basic command is issued and Break is pressed, PAGE drops to &2800 instead of the more usual &1900 as on DFS machines.

This could be due to the fact that there is a CP/N ROM in the default ROM socket, but why would a ROM with a machine code written for the Z80 in it need workspace when the 6502 is running?

Also, if it does need some workspace, why not use some of the 64k of memory which the Z80 has with it? – *R.C. Swain, St Helens.*

**● You can switch between 40 and 80 tracks with a software command, but this is only available on certain non-standard DFS ROMs.**

**The one I use is by Watford and you can change to 40 tracks by typing *FX110,0,255. It is not possible to do this on the Acorn DFS.**

**The CP/N ROM contains code written in 6502 machine code to enable the BBC to be used as a CP/N input/output device. It doesn't contain Z80 machine code – that is stored on a ROM on the second processor board itself.**

**Upon power up, the operating system asks each ROM if it wants to reserve any space. The CP/N ROM says "Yes please" as it does not know you don't want to use it.**

**Try making this ROM not the default ROM and then reset the value of PAGE.**

## Invasion hold up

I HAVE keyed in Alien Invasion by Tom Blackburn from the February issue of *The Micro User*, but have run into a problem which I hope you can help me with. Needless to say I have checked and double checked the input but can not find any error.

When the program is run I get ERROR LINE 20 – HIMEM NOT SPECIFIED. To remedy this I inserted a value for HIMEM=31744 at line 6.

This has allowed the program to be run to some extent until the base is hit. Then the score and high score numbers change to undecypherable cyan symbols and the high score words change colour to cyan too.

This in turn causes another error in the Hall of Fame, where the score is not recognised by the computer. – *S. Ebrahimi.*

**● Take your computer immediately to the dealer as this error message indicates it is about to explode!**

**PS: Acorn have never heard of this one either.**

## 'twas not to be . . .

BEING an avid reader of *The Micro User* and wanting a ready made map of Europe, last January's issue was a godsend.

The mere triviality that my computer was a 32k Model B, Basic I, OS1.2 seemed (at the time) unimportant.

I realise the program was written for the Electron, but as there were no indirect imperatives involved I wasn't too worried as I thought at least the plotted data would be useful.

Alas poor Brian, 'twas not to be (I never did trust those DIM(I%) anyway).

If I promise never to use Electron software (even typed) on my Beeb could you let me have some idea of how to amend the listing.

Looking forward to a decent night's sleep. – *B. Tomlinson, Sutton-in-Ash, Notts.*

**● I am stuck here. The program works OK on my machine, although I have to confess that I did not type it in but used that issue's tape. Can any reader help?**

## Joystick warning

I RECENTLY bought a £20 set of joysticks with the intention of using them with a BBC Micro. Unfortunately they turned out to be little more than a few on/off switches operated by a stick and were totally unsuitable for my purposes.

I have always been under the impression that a joystick is an analogue device and not, as these were, digital. On this basis I returned to the shop and requested a refund which was flatly refused.

I then wrote to the shop to request a refund, and received no reply. I telephoned, getting another refusal but an offer of a credit note enabling me to buy something that I didn't want.

I feel it would be wise to warn other micro users not to make the same mistakes. Before buying any accessory check that:

- The dealer offers a reasonable service and has a fair policy on the return of goods.
- The accessory is clearly

→

**You've got a problem with your micro and you just can't sort it out on your own? Then write to MIKE COOK. If he can't help then probably no one can . .**

**IF you have a technical query for this page, send it to Mike Cook, *The Micro User*, Europa House, 68 Chester Road, Hazel Grove, Stockport SK7 5NY.**

**Letters on other subjects should be sent, as usual, to Micromail, which this month starts on Page 177.**

*From Page 71*

described on the packaging or receipt and that the description suits the purchaser's requirements.

- If there is any doubt, insist on a demonstration before parting with your money. – *S.W. Maxwell, Southsea, Hampshire.*

- **A joystick can be either analogue or digital – this was explained in my article in the May 1983 issue of *The Micro User*. Therefore you have not been misled by the company, and they were perfectly right to sell you what they did.**

**To make sure you get the analogue type of joystick you must specify that it is a proportional joystick you want.**

## Still waiting . . .

IN the first edition of *BBC Micro User* dated March 1983 there appears on Page 50 an article headed Beeb Body Building Course.

In it there is a "... sneak preview of what is coming up" including "a way of connecting a TV video camera to your BBC computer".

I have bought every issue of *The Micro User*, but have been unable to find any trace of this item in subsequent issues.

Could you please tell me in which issue the item appeared, or, if it is still awaiting publication, in which issue it is scheduled to appear? – *Nic Small, Brighton.*

- **It is something I want to do, honest. It is just that I have not had the time so far to tackle the project.**

**I'll try to fit it in as soon as I can.**

## Think it into submission!

I HAVE a BBC Model B with OS1.2, Watford DFS (fitted by myself) and 100k Pace disc drive.

There's a small problem with the disc drive which Watford and Pace have not been able to help me with, but on taking the drive to my local dealer it works perfectly.

Although the drive operates and has been doing so for six months, on putting the disc in the slot the motor starts to run but the indicator light remains out, and it only stops running when the lever is down.

Open the lever and the motor remains off until the disc is removed, when the motor starts again, runs for a few seconds and then turns off on its own.

Can you solve this problem as I fear it may eventually damage my discs. – *D. Ryder, St Helens.*

- **This is the well known case of "it works when a dealer is looking at it but not when I do it". You have to be positive and think the drive into submission, let it know who is the boss, and then it will start to behave.**

**Alternatively you could check that all the leads are correctly seated at both ends of the disc cable and that none of the chips in the disc drive interface have a leg bent underneath them.**

## Using the Atom RAM

I RECALL reading somewhere that no significant benefit could be gained from linking the BBC Micro to an Atom.

This is a great shame, since the humble Atom is not the easiest creature to dispose of. On the other hand, it does have certain features which I am sure could be of some use to the BBC Micro user.

The most obvious of these is the 12k of RAM. With this in mind I wonder if it would be possible to use the Atom as an extended printer buffer?

I have no technical knowledge whatsoever, which is probably why the idea sounds so promising. Perhaps you would like to give it some thought. – *Nick Kiey, Plaistow, London.*

- **Thanks for the suggestion, it would be a good idea to use an Atom in this way.**

**Unfortunately I have not right now got the time to do this, but would consider printing an article from anyone who has!**

## A TV into a monitor

I HAVE a Grundig B3404 TV and I wonder if any reader knows how to convert this to a monitor/TV, or indeed of any dealer who would carry out this conversion.

I have been taking *The Micro User* since I bought my BBC Micro and I think it is the best magazine on the market. Keep up the good work. – *T. Franklin, Northampton.*

- **Without knowing all about the inside of this type of TV let me say what you will be required to do.**

**First of all you need to fit an isolating transformer to the set. Then you need to tap into the video driver circuits with the RGB signals.**

**As the resolution of the tubes used for a TV set are generally lower than that used on monitors the result will be of inferior quality and I do not think it is worth the expense.**

**Try Irvine Developments on 0294 72431. They carry out this type of work on ex-rental TVs.**

## Changing mode

IN reply to Mr Layton's letter about how to change mode in a procedure, you use VDU 22,2 to change to Mode 2. The number after the comma is the mode number.

Please could you tell me which pins to use on my user port to use a home made light pen that fits into the analogue port on the BBC Micro?

Lastly, can you tell me where to get an SD 4324-002 Sweetspot light detector for the light pen which is featured in the Beeb Body Building Course Part 6? – *Ian K. Levy, aged 11, Leeds.*

- **Yes, this will work, but use it with caution as some of your variables can be overwritten. It is usual to come down in modes, that is change from Mode 2 to Mode 7, but not the other way round.**

**A light pen cannot be fitted into the user port as there is no connection to the CRT controller chip from that socket.**

**You can get the Sweetspot from the *Micro User*, along with all the other bits – or see my Problem Page in the July 1984 issue.**

# Pots of problems...

I HAVE attempted to build for my son the graphics digitiser as detailed by you in the June 1983 issue of *Micro User*.

I am unable to calibrate it as described and I wonder if you could suggest what may be wrong.

I have checked the wiring thoroughly and can assure you it is correct.

It was suggested by one of the representatives on the Technical Advice stand at the recent Electron & BBC Micro User Show that I may have logarithmic pots.

This I have checked with the supplier, who assures me that they are wirewound linear pots and the correct value.

The pots have a travel of approximately 270 degrees. At one extreme I am able to calibrate below 1023 but I hit zero after travelling back approximately 150 degrees. I have identical results on both pot A and pot B.

I realise it is difficult to give advice without seeing what I have done, but perhaps it is obvious to you from my description what is wrong. – *H. Martin, Edinburgh.*

- **The problem might be insufficient adjustment on the preset pots Ps1 to Ps4. To remedy this you could insert a series resistor with one or more of these pots.**

**Try using a 10k one, as this will give you adjustment that starts where it previously left off.**

# The Aries File

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- A & B Computing, March/April 1984

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SPY2 features a disc sector editor displaying the contents of a whole sector; disc search facilities for finding byte patterns or strings and free disc space. Files may be recovered by creating a directory entry with all the data concerning the deleted file. Directory entries can be easily amended using the *AMEND command. The *FORMAT command formats discs with any number of tracks. A verify command checks discs. The *REFORMAT command is extremely useful for recovering information from a bad track, reformatting it and restoring the data. Commands are included for loading files at &1900 and automatically downloading (and running) them.

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# GOING ON THE RAM PAGE

### By TONY PHILLIP

**HOW many BBC owners have gazed enviously at those clever ROM chips now available and wished they could write even a little one for themselves? But you need an epromer to put your program in and a UV eraser to take it out again when it doesn't work.**

However many people have now acquired sideways (the technical term is "paged") ROM boards with spaces to add extra RAM chips. Also dedicated RAM boards are available quite cheaply.

This makes it possible to write and easily correct ROM type software which runs in this upper RAM area. All that is necessary is to get the first two dozen bytes set up correctly and then to use a few fairly short machine code routines.

Sideways ROM lives in the area of memory from just above the screen to just below the operating system chip, that is from addresses &8000 to &BFFF, thus occupying a maximum address space of 16k.

The read/write line from the microprocessor is connected through some circuitry to the sideways ROM. In the normal BBC Micro writing some data to a ROM will have no effect, so it is usual to wire up the sideways RAM so that any write operation within addresses &8000 to &BFFF is directed to the sideways RAM.

This is all taken care of in the design of the particular ROM/RAM board you may have.

Unless you have multiple sideways RAMs no special programming is necessary – just follow the programs given.

When searching for a ROM the operating system switches each on in turn, starting from number 15. This is the most easterly of the four sockets just in front of the keyboard. It keeps track of the current ROM number in a zero page location &F4.

It is impossible to directly access a sideways ROM from Basic, since Basic is itself a sideways ROM. However by handing control over from Basic to a short machine code program it is quite easy to call up other ROMs.

The operating system works out whether there is a ROM in any one or more of the 16 possible ROM spaces by recognising a specific few bytes near the beginning of the ROM. If these are absent then the operating system will ignore that ROM number.

The operating system may need to enter a ROM for two different reasons. The first is the service entry where a service is requested by ROM A and is provided by ROM B, which then passes control back to ROM A.

An example of this occurs when a Basic program asks a disc filing system to CHAIN a program held on disc.

Control is handed over to the DFS, which loads the program and then hands control back to Basic in order to run it.

The second reason is the language entry where the selected ROM is entered and control is taken over by a language in that ROM. One way out of a language is by a hard break (Ctrl+Break) which should return control to Basic. For convenience the soft break has been designed to return control back to the selected language.

When the operating system comes across a command it does not recognise the ROMs are scanned and given the opportunity to react to the unrecognised command.

The programs given in this article add the new commands *RAM and *RAML. These make a service and a language entry respectively into the ROM.

Once within the ROM a routine has been provided to demonstrate the service entry.

The listings are written in Basic and by now it should be reasonably obvious that we cannot access another ROM from Basic.

So when the assembler is used it assembles the correct codes, but when it tries to print them out, it reads them from the Basic ROM, not the sideways RAM you have written to – so your listing will look rather odd.

The correct bytes – shown in Table I – are as follows:

**&8000–8002:** Holds the location for a

→

*The first few bytes of the ROM must be set up like this:*

| Address | Hex | Instructions | Note |
|---|---|---|---|
| &8000 | | .ram | |
| &8000 | 4C 7D 80 | JMP langentry | 1 |
| &8003 | 4C 25 80 | JMP serviceentry | 2 |
| &8006 | 82 | EQUB &82 | 3 |
| &8007 | 11 | EQUB &11 | 4 |
| &8008 | 01 | EQUB &01 | 5 |
| &8009 | | .title | |
| &8009 | 52 41 4D | EQUS "RAM" | 6 |
| &800C | 20 | EQUB &20 | |
| &800D | 31 2E 30 30 | EQUS "1.00" | |
| &8011 | 00 | EQUB &00 | 7 |
| &8012 | 28 43 29 31<br>39 38 34 20<br>47 2E 41 2E<br>50 48 49 4C<br>49 50 | EQUB "(C) 1984 G.A. PHILIP" | |
| &8024 | 00 | EQUB &00 | |
| &8025 | | .serviceentry | 8 |

*Table I: An example ROM/RAM configuration*

*From Page 75*

language entry into the ROM. Control will pass from the old language via a JMP xxxx to the new language.

**&8003–8005:** Holds the location for a service entry. All ROMs must have a service entry (only the Basic ROM does not have one). The address from which the service has been called is stored on the stack, so that by executing a RTS, control is easily returned.

**&8006:** This identifies the ROM type. In binary, &82 is 10000010. Bit 7 indicates that the ROM has a service entry. This must be set. If bit 6 is set, this indicates that the ROM has a language entry and may be considered for selection on a hard reset. In this example, the bit is left unset and so, while the ROM can still have a language entry, this has to be explicitly started up (for example *RAML) and will only be reselected on a soft break. Bit 1 must be set.

Note that EQUB is a Basic II command which places a single byte into the memory pointed to by P%. In Basic I the equivalent is:

```
]:?P%=&82:P%=P%+1:[
```

EQUS places a string – its equivalent is:

```
]:$P%="xxxx":P%=P%+LEN($P%)+1:[
```

Both of which are followed by the appropriate OPT.

**&8007:** Copyright offset pointer. By adding the number here to &8000 we get the location of the first byte of the copyright message for example at &8011.

**&8008:** The binary version number. This is of no relevance to the system. A user may like to know that this is Version 1.

**&8009–8010:** The title message – in this case RAM 1.00 will be printed up on a *HELP. It is also used here as a convenient way of providing a command name.

**&8011–8024:** The copyright message. This, like the title message, can be of any length since its start has been pointed to by the copyright pointer. The crucial four bytes are the "(C)" (&00 &28 &43 &29) which identify the ROM to the system. The message itself must be preceded and terminated by a zero.

**&8025:** Free for user machine code programs.

The two most common reasons for the operating system to make a service entry are firstly when an unrecognised * command is detected (for example *RAM) and secondly in response to the *HELP command which asks each ROM to identify itself, usually by displaying its name on the screen.

We must first provide a way of selecting between these alternatives and, if neither apply, control should be returned with all registers preserved.

On a service entry, the operating system marks the place where it has come from (by saving this address on the stack), turns on the first ROM and jumps to the address given in the service entry.

The accumulator contains 4 if there has been an unrecognised command or 9 if *HELP has been used. Other service

→

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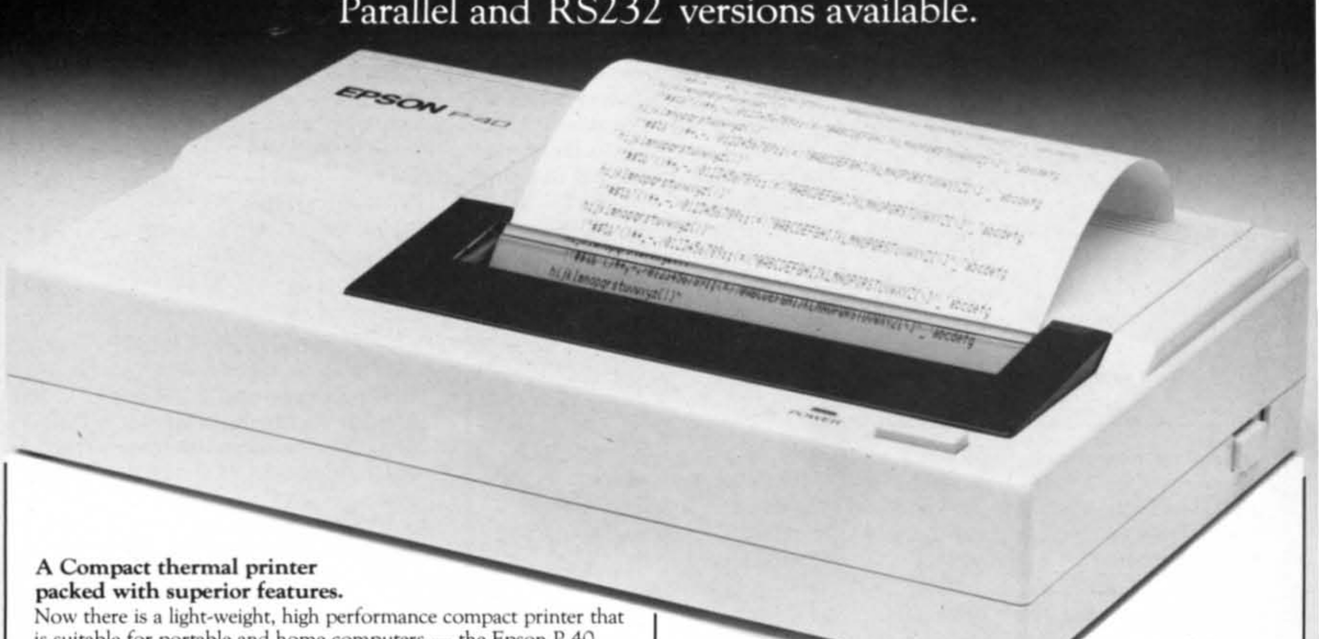

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From Page 76

types are possible but we shall ignore them here.

At the service entry we place this routine:

```
.serviceentry
PHP             save status register
                before it's changed
                by CMP
CMP #4
BEQ unreccomm   if A=4 goto
                unrecognised command
                routine
CMP #9
BEQ help        if A=9 goto *HELP
                routine
PLP             if none of these retore
                status register
RTS             return control to
                address on top
                of stack
```

Next we must enable the ROM to identify itself on a *HELP command. All registers must be preserved to enable other ROMs to be presented with the same information.

```
.help           stack holds status
                reg and RTS address
PHA
TXA
PHA
TYA
PHA             stack holds Y,X,A reg.
JSR osnewl      print blank line
LDX #0
.titleloop      print RAM 1.00
LDA title,X     i.e. 8 bytes
JSR owswrch
INX
CPX #8
BNE titleloop
JSR osnewl
.out            return control with
                all registers
                preserved
PLA
TAY
PLA
TAX
PLA
PLP
RTS
```

A development of this – not shown here – could enable the ROM to display its own commands and syntax on entering *HELP RAM.

Where, on entry, the accumulator contains 4 the X register will hold the ROM number (probably 15). Locations &F2 and &F3, offset by the contents of the Y register, point to the start of the unrecognised * command which has occurred, for instance, in a Basic program or which may have just been typed at the screen.

Again, all registers must be preserved in case the ROM does not wish to provide any service.

This program detects whether the * command it is looking at is *RAM. If it is control is passed to the demonstration routine. If it is not an orderly exit is made.

```
.unreccomm          stack has status
                    reg and RTS address
PHA
TXA
PHA
TYA
PHA
LDX #0
.unrecogloop        compare
LDA (&F2),Y         unrecognised
CMP title,X         command with *RAM
BNE nothisrom
INY
INX
CMP #3              check for 3 letters
BNE unrecogloop
LDA (&F2),Y
CMP #ASC("L")       if RAML go to
BEQ languageentry language entry
JMP demonstration if not *RAML goto
                    demo program
.notthisrom
JMP out             orderly exit if
                    not *RAM
```

When the service has been provided, the stack should be cleared and control returned with the accumulator set to 0 which indicates to other ROMs that the service has already been provided.

```
.exit
PLA          pull registers
PLA          off stack
PLA          - including
PLA          status register
LDA #0       service provided
RTS          return to BASIC
```

Any number of commands may be added in this manner by providing a routine at .unrecogloop to compare the unrecognised command with a table of possible commands.

A language entry does not expect to return to Basic – the ways to do this are either by providing a special command within the language or by a hard break. A soft break will enable you to stop executing your language (rather like Esc does in Basic) but without actually leaving the language.

The method of language entry used here is for a language command to be explicitly used – *RAML. On recognising *RAML, the ROM will start itself up as a language by performing an OSBYTE call (&8E, with the X register holding the ROM number).

```
.languageentry
LDX &F4      &F4 holds ROM no.
LDA #&8E
JSR osbyte
```

This call marks the ROM number as the one to be selected on a soft break and then displays the ROM name. The ROM is reentered (a JMP not a JSR) with A=1 (the normal language startup code) via the ROM's language entry point.

Writing a language properly is a long job and so is not described any further.

The complete listing is given again and includes a useful demonstration routine which prints out a hex and Ascii dump of the memory of your RAM at &8000 onwards.

Key in the program and RUN it. Press Break. Now enter *HELP and you should see that the ROM identifies itself.

Enter *RAM and the demonstration utility will print out the starting address of each group of eight bytes, then these bytes, first in hexadecimal (for example &41) and then the equivalent in Ascii, say A.

Control characters and user defined graphics are printed out as a dot. Press the space bar for another block of eight lines or press any other key to return to Basic.

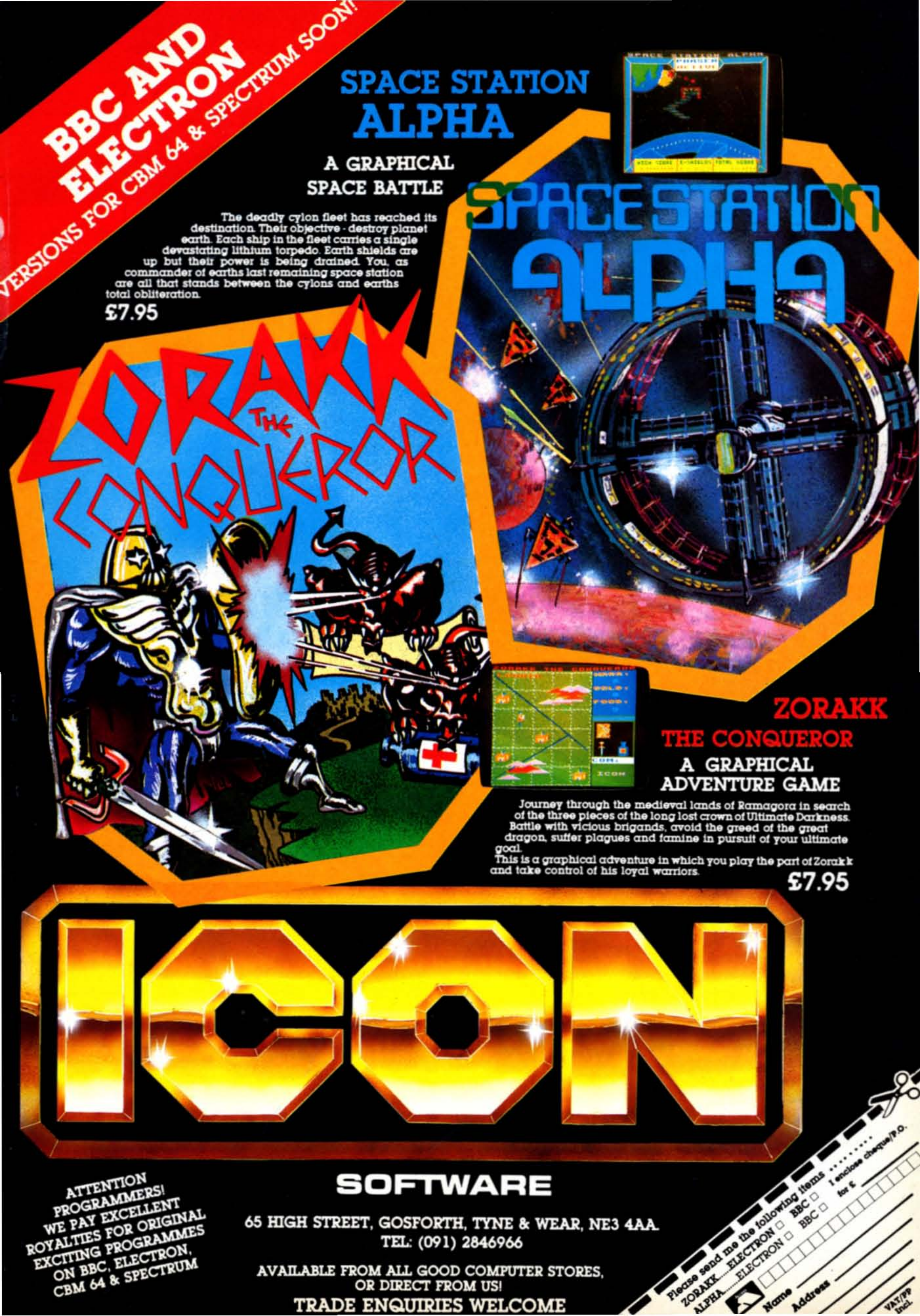
Write a short program such as:

```
10 PRINT "address  hex      ascii"
20 *RAM
30 PRINT "end of hex dump"
```

This shows that the new command is available both directly at the screen and from Basic programs.

Now you have a good excuse to get into machine code programming. So go to it!

Full listing is on Page 168



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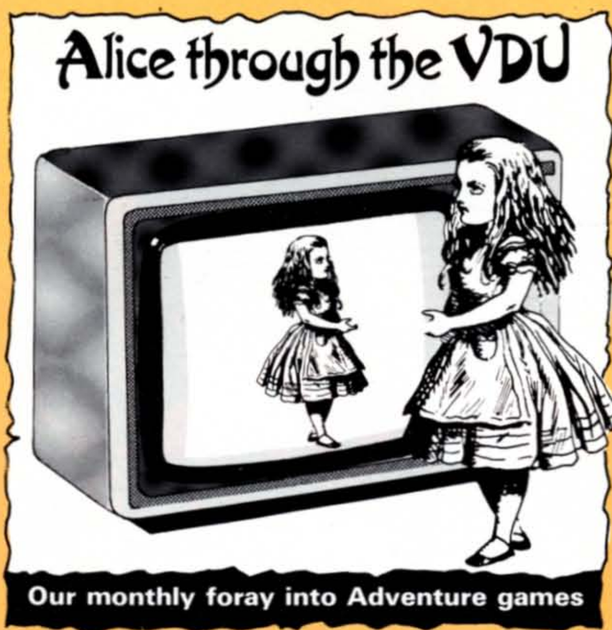
Alice through the VDU
Our monthly foray into Adventure games

# Bulldozing through to Ithica, beset by many bugs

**THE Pen and the Dark by Mosaic is a Basic program (so BREAK, OLD, LIST) with simple verb/noun commands plus occasional prompt. And you get the complete story on which the game is based in a booklet.**

It should be easy, but it ain't because it has a few bugs and also involves four or five trips over the same ground, plus some quite complex manipulation involving what I call the "dropped pearl" trick.

That is, you do something in one room (open clam) and an object (a pearl) "appears" in some other room.

The program is full of this trick and it takes hours to sort out because you are not allowed to anticipate the plot.

Your name, who sent you and your profession – unorthodox engineer – is given in the story and coded in line 3980. The author must have a suspicious mind.

Your task is to bash your way, using random force and ignorance, into a mysterious dark column of negative energy on the planet Ithica. Incidentally, negative temperatures are possible – lasers "cool" when energy is injected.

Working backwards, and from the story, you have to get some light to the penumbral edge of the dark (Room 35).

I got the generator and the laser both connected, but the program still said I needed light because the connector had somehow been dropped in the previous room (29) and the program wouldn't let me pick it up again or disconnect anything.

Another bug was that whenever I lifted something the object seemed to follow me around.

There are a few other funnies. Driving the crawler is hard work – why not use the arrow keys? – so I got into the habit of only using three letter words.

These were adequate most of the time but occasionally misunderstood, and I still can't fathom how you legitimately discover the allocation code.

One unusual feature is that you cannot QUIT or be killed in this game, so the SAVE is doubly useful.

Despite the bugs the game is a clever adaptation of the story with some neat touches. You get one wish granted at the fountain and a "pearl" drops in the office. And there is only one red herring.

There is hardly any HELP in the game and you have to learn to use some quite unusual words, plus appreciate that the opposite of LIFT is not DROP.

A hint sheet is available from Mosaic for those who have grown weary of the rough ride back and forth on the road to Bethlam.

Actually I think Louis Wu in "Ringworld" was a lot more unorthodox at solving engineering problems and a sniff of the tree of life would certainly be more interesting than drinking Ithican wine. The ring of pearls you'd then see would be a lot more difficult to shift and modify.

# Nuts to Diaphantos

IF you want a game for kids under 10 then you might try Castaway by Simonsoft. It contains lots of pretty pictures, nice sound effects and silly logic, plus the real boon that you get a complete solution which you can hide from them.

I never know how hard a game is when given a solution. (Would I have ever thought of doing that?) So I belted through it, got stuck in a swamp maze and forgot not to go down.

Talking about mathematical puzzles and castaways, I've decided that this month you lot can write the clever program to solve a problem that has baffled thousands before the home micro appeared . . .

*Five men and a monkey called Diaphantos were castaway on an island. They spent the day collecting a pile of coconuts and then went to sleep.*

*In the night one man woke, divided the pile into five equal parts and threw a spare coconut to Diaphantos. The man then hid his share and went back to sleep.*

*Each of the other four men did exactly the same. Came the dawn and the men divided the remaining pile exactly between them.*

Now I've always felt sorry for the monkey who only gets five coconuts when the final pile could have been split six ways, so in my version there are five men and three monkeys in a union.

Each monkey gets five coconuts during the night – 15 in all – but their leader insists on an eight way split in the morning.

How many coconuts did the monkeys get this time?

# Have fun with 5 4 and 12

To solve the MOD2HEX safe puzzle in the July edition of *The Micro User,* dial the three co-prime numbers 7, 11 and 13 and you get three results A, B, C.

These are unique and could be used in a three-dimensional lookup table (7*11*13). But more elegant is XXX=(715*A+364*B+924*C) MOD 1001.

The first correct answer came from Brian Ellsmore of Christchurch, Dorset, who wrote: *"Ah! But where do these numbers come from you may ask".* Then he showed how he derived them, finishing with: *"Wasn't that fun!".*

The proof uses some elegant maths invented by Guass and beyond the scope of this article, but knowing the answer may help others to sort it out. Note that:

**1001=7*11*13, 715=5*(11*13),**
**364=4*(7*13)**
and
**924=12*(7*11)**

so all you really need to derive or remember are the numbers 5, 4 and 12. Have fun.

# Talking of pigs in opposition..

A Mathematical Adventure by the Association of Teachers of Mathematics contains Fibonnacci phones, Platonic solids, pigs in opposition, codes, opening safes, weighing problems and filing blank keys.

It reminds me of a friend of mine who gave a talk about his chess program – probably the best in Europe at the time – and was told by some creep afterwards that his talk had mentioned everything the creep intended to put in his own program.

You may have guessed that I like mathematical puzzles (thanks to Uncle Charles and, more recently, Martin Gardner) where a few lines of text can set a problem that takes weeks to solve.

An example is: *Find integer solutions for I, J and K where I∧3+J∧3=K∧3.*

This program starts off with you and your boring old sister reading her boring old book – definitely *déjà vu* and still no pictures.

Then you're into the palace with lots of text describing the rooms. This is rather slow because they are pulled off disc, but it's so easy to SAVE and LOAD.

I'm not allowed to give anything away, but I can solve most of the puzzles from memory. I still had to look up the old Sam Lloyd problem of how to plant nine trees in 10 rows of three trees each.

Graphics, in this case, really do add a new dimension to the game because they can present some nice geometrical problems.

I would have liked to have seen the ball bounce on the oval billiard table but, of course, it is much easier to pot than on a round table.

Uncle Charles once remarked that the regular polyhedra are "provokingly few in number", which is certainly true when it came to using them to map the turtle's maze.

I also had quite a job finding the rope ladder after the owl flew off with it – another "dropped pearl".

I liked it and there is no point in cheating because the answers are not in the program.

# Lowdown on programming adventures

IF you think you have some great ideas for an adventure, but don't know how to program, then get the book "Exploring Adventures on the BBC" by Peter Gerrard.

Although the author has converted it from another micro – hence a few niggles – he has broken the process up in a logical and interesting way.

First he discusses some old classics – in particular Colossal Cave – to give some flavour of how to play and solve them. To do this he has given quite a few answers to Colossal.

Unfortunately some are incorrect. You shouldn't get the batteries and you don't draw maps to solve twisty mazes.

He then introduces the main program in the book, Underground Adventure. He gives a list of all the verbs and nouns in the game so that you can follow how the verb/noun commands are processed and applied.

This requires a short introduction to some relevant Basic commands.

Because he is converting to the BBC he tends to dismiss PROCs as named GOSUBs but, as his programs never pass any parameters, this is possible.

Because Basic lacks a CASE statement, I always look for an ON [verb] GOSUB to handle the actions and movements. And there it is on page 102 – all the usual words like GO, GET, DROP, etc.

Oddly enough he doesn't have DIG, but he does include REFLECT and SPRAY which makes him raise the important question of how you get the player to use unusual words. His answer is to provide hints whereas some other games give you a list of words when asked for HELP.

Chapter six deals with the verbs one at a time. You get a copy of the listing in each case – no typesetting errors – with an explanation of what each line does and why. In this way you get a clear idea of the purpose of the various parts of the program.

Finally, having typed and possibly understood all the bits of the program, you then enter the data for the 100 rooms plus directions "between 1 and 4?".

There is also a short explanation of how objects are placed or dropped in the rooms and that's it.

The author has indeed presented "clearly and logically a complete adventure".

There are two more adventures in the book and all three are available on a cassette for those who can't type.

Although slightly dated – circa 1982 – it's the best and most accurate book I've seen so far on how to program a traditional game.

**Alice**

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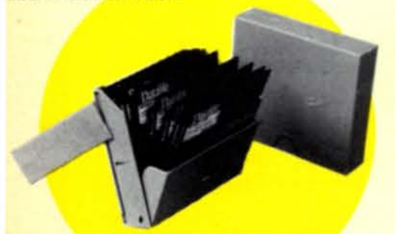

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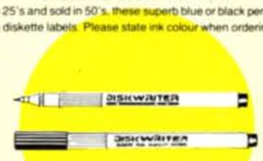

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During your search, you will receive visible warnings of impending danger.

For example: "Gosh, what a pong, you can smell Wampus" means exactly what it says, and the rest is up to you.

There are more hazards to meet on the way, but if I told you everything it wouldn't be an adventure, would it?

He who has not hunted the Wampus . . . has not yet lived; he who has . . . has perished.

**Alan Denham**

## PROCEDURES

| | |
|---|---|
| IN | Instructions |
| LOC | Your location |
| MAP | Draws map |
| WARNINGS | Warns you of hazards |
| WAMPUS | Warns you of Wampus |
| BATS | Random movement |
| FALL | Kills you |
| SPID | Traps you, moves Wampus |
| DEAD | Kills you |
| KILL | Kills you |
| EATEN | Kills you |
| SHOOT | Shoots, counts ammunition, moves or kill Wampus |
| WIN | Fanfare |

## VARIABLES

| | |
|---|---|
| AR | Number of arrows |
| WA$ | Wampus location |
| P1$,P2$ | Pits |
| B1$,B2$ | Bats |
| S1$,S2$ | Spiders |
| CL$ | Player location |
| LV$ | Cave level |
| N$,O$,P$,Q$,R$,S$ | Adjacent caves |
| A$,B$,C$,D$,E$,F$ | Adjacent caves |
| T$,U$,V$ | Arrow targets |

Other variables are input for immediate use, graphics, or merely counters.

# WAMPUS

Full listing starts on Page 170

# Warning: these ga

Kingdom of Hamil

# nes show no mercy.

Acornsoft have now unleashed eight more merciless games onto unsuspecting BBC micro owners.

Ranging from 'Gateway to Karos', where putting a foot wrong could mean instant death. To the relentless antics of Drogna which could have you dying with laughter.

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As the rightful heir to the Kingdom of Hamil, you are in the unusual position of having to prove your claim to the throne. Evil people are trying to prevent you accomplishing your task by any means. An adventure game fraught with many dangers, puzzles and problems.

## Tetrapod.

You're in an arena littered with dormant lizards, killer bees and other hostile creatures with whom you'll have to do battle to survive. But beware of your own laser bullets, as they bounce off the arena walls.

## Drogna.

A game for two people – preferably with devious minds. There are two vaults containing diamonds and your job is to collect and transfer them to your home base. While your opponent is out collecting you could sneak in and steal his loot... but keep an eye out for him doing the same to you.

## Crazy Tracer.

An arcade style game where you're in charge of a paint roller. Guide your roller around a maze of rectangles while evading monsters who are committed to destroying it. Gain extra rollers and bonus points by painting different objects. But you'll have to avoid running out of paint.

## Volcano.

Mount Crona has erupted after 150 years of silence. And your mission as an Emergency Rescue Helicopter Pilot is to save sightseers stranded on the slopes. Time is of the essence as the lava approaches the sightseers. But you'll have to take time to evade – or shoot – the boulders being hurled from the volcano.

## Carousel.

A re-creation of the fairground shooting gallery – with a difference. Shoot down all the ducks, owls and rabbits before you run out of ammunition. Watch out for the low-flying ducks. If you fail to shoot these, they'll steal your bullets and reduce your chances of success.

## Meteor Mission.

On an alien planet are six stranded astronauts. Launch your capsule from the Mothership and by avoiding – or shooting – meteors and alien craft, pick up the astronauts one at a time and return them to the Mothership.

All games – with the exception of Gateway to Karos which is currently only available on cassette – can be bought direct in either cassette or disc form. You will find all these programs at your local Acorn stockist. To find out where they are simply call 01-200 0200. Credit card holders, phone 01-200 0200, anytime. Or 0933 79300, during office hours.

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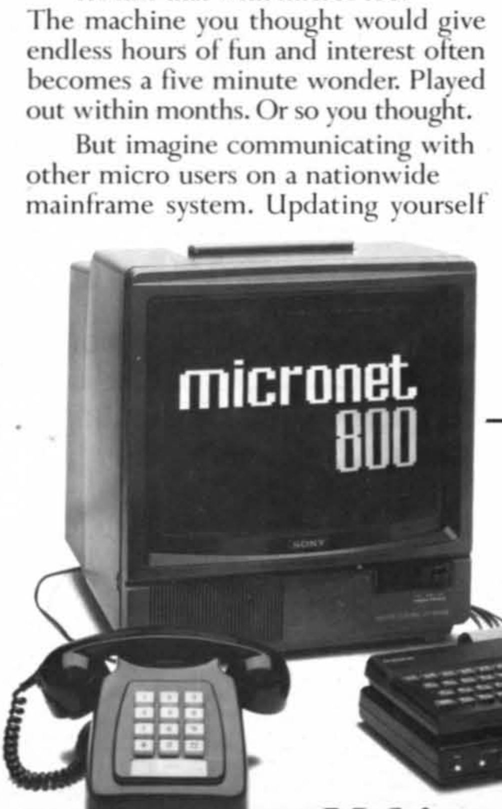

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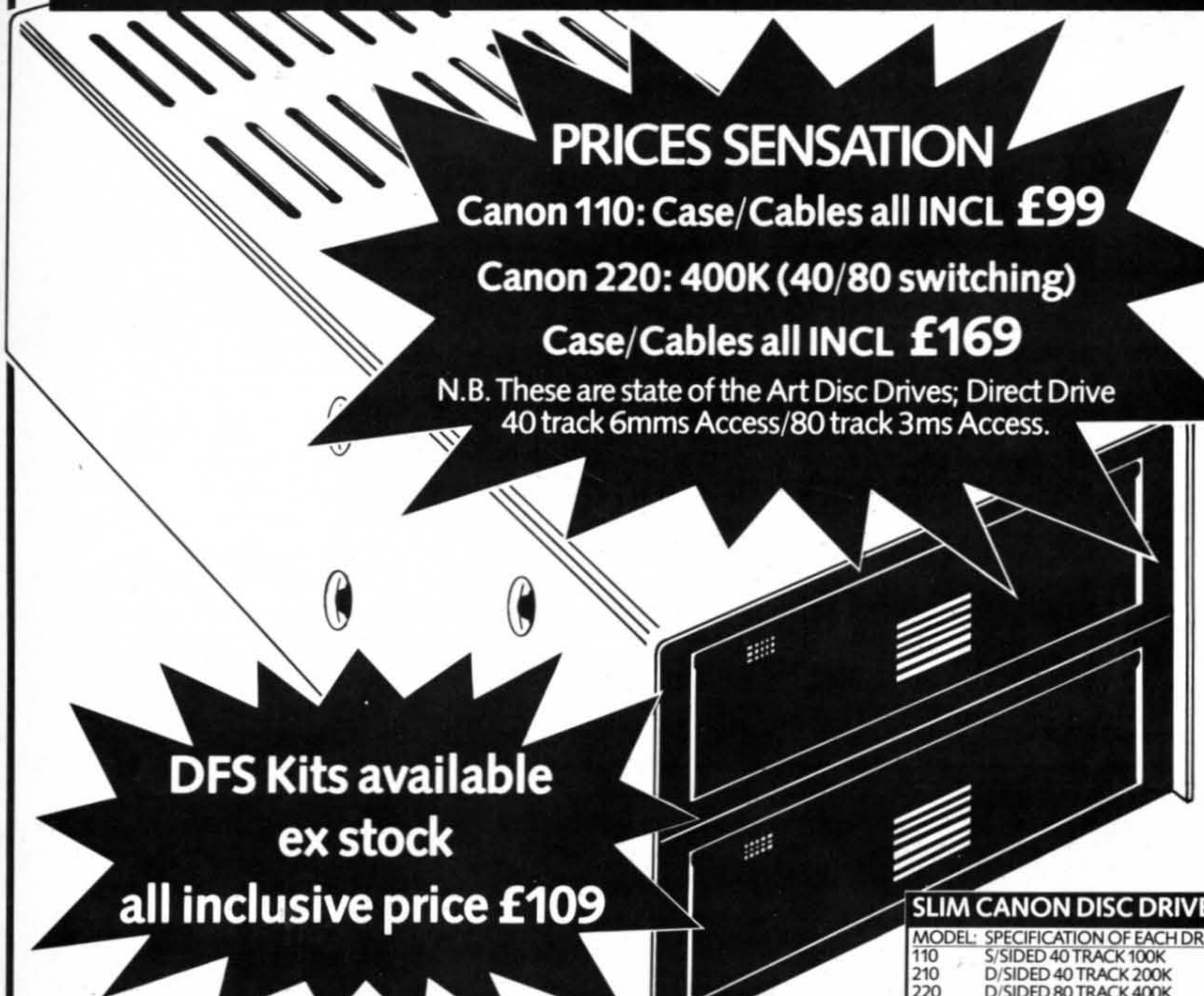

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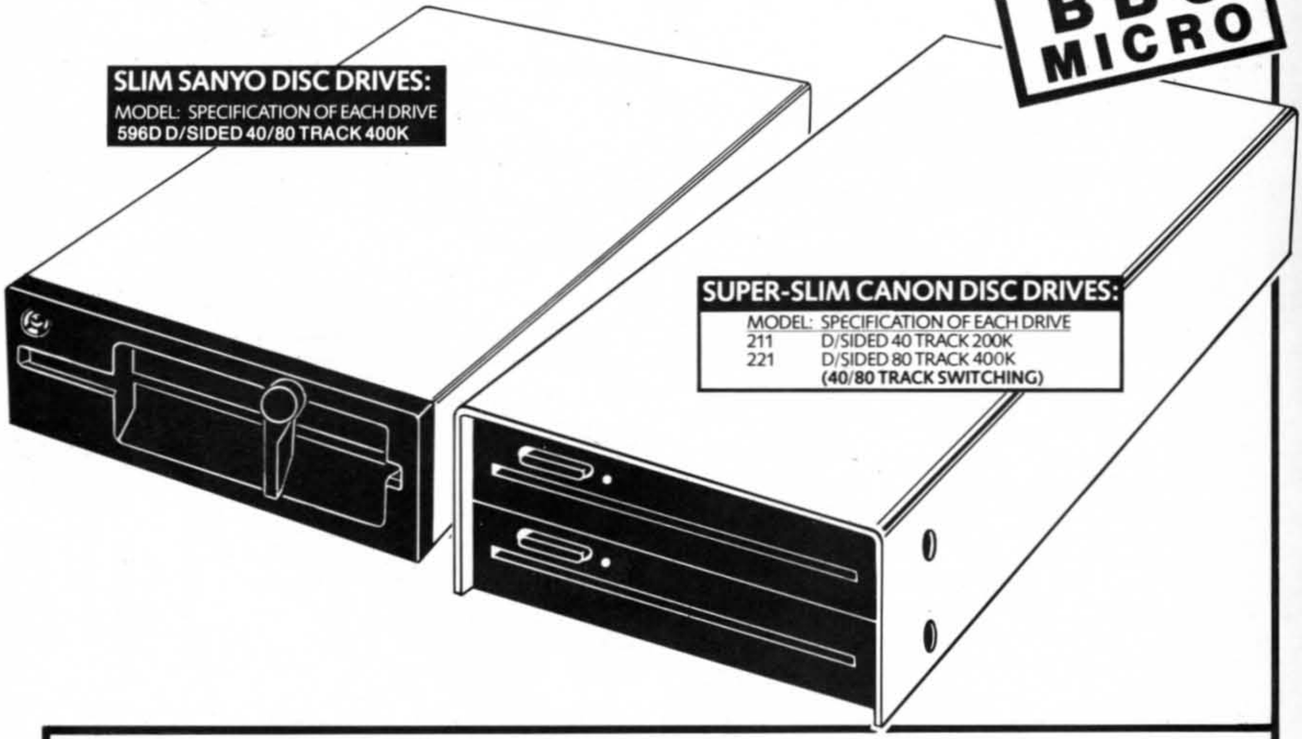

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# SPLIT THE

### There are two methods of splitting your monitor screen. MARTIN MILLEN recommends the second one.

**A FEATURE frequently seen in business software is the use of the split screen, a powerful facility that can be produced on the BBC Micro but is often under-exploited, even though it can overcome a variety of problems.**

One snag in developing long programs without the use of a printer is the difficulty in comparing one part of a program with another since it is only possible to see a limited number of program lines at once.

The listing shown here provides a split screen effect through the use of text windows where two, three or even four different parts of a program can be seen at one time.

This facility has many applications. It is of particular importance in writing structured programs since it permits the programmer to view both a defined procedure and that part of the program which calls it at the same time.

In many cases it is also possible to arrange things so that the relevant part of a listing appears on one screen while the program is running and producing results on another.

A small demonstration of this possibility is included in a procedure called PROCDEMO. However it is only possible to use this particular technique if your program runs in Mode 0.

The different screens are called by the various function keys. In order that the whole should perform as an overall programming aid a number of other useful functions have been incorporated.

The utility is presented as a standalone program, although it is intended to be used as a group of self-contained procedures that may be tacked on to the end of any program under development.

The utility is written entirely in Basic and should present little difficulty to those wishing to understand how it works. It is hoped that some of the techniques may prove of interest for use elsewhere.

It has been structured in such a way that there should be no problem in expanding it to provide other facilities if required.

It should be pointed out, perhaps, that the blank lines such as lines 80, 110, 150 and so on, which have been inserted to improve readability, have in fact got one space in them – to hold them in existence.

At only five bytes per line, this is probably memory well spent. The utility occupies about 2¼k and this will normally be acceptable.

By compacting it down, and through the use of multi-statement lines, it could be brought down to within 1k, if this proves necessary.

As everybody knows there is a VDU-command – VDU 28 – that enables text windows to be set up so that only part of the screen is in use. At first sight there seems to be little point in limiting the display to less than the whole screen.

What is not immediately apparent however is that when you define a text window, whatever was on the rest of the screen beforehand remains unaltered and will stay there until you redefine the text window to include that part of the screen once more.

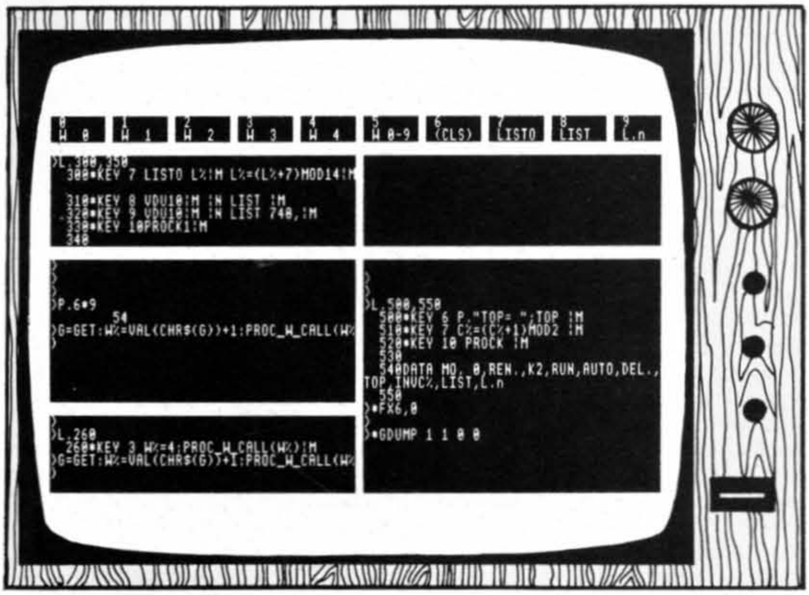
This is the technique we shall use to split the screen. First we define one window, on the left hand side for example, and display part of the program in it. Then we define a second window on the right and display a different part of the program.

The lines listed in the first text window will remain until we define that window once again.

By programming the function keys to do all the hard work of calling the window routine and providing the parameters, changing screens can become a matter of pressing a single key.

The procedure that sets up the windows is PROCWINDOW. The four parameters passed to it are the two pairs of coordinates that define the bottom left and the top right corners of the text window.

In fact this procedure is a little more ingenious than you might imagine as it contains not one but two VDU28 commands, the second of which uses



```
>L.300,350
  300*KEY 7 LISTO L%!M L%=(L%+7)MOD14!M

  310*KEY 8 VDU10!M !N LIST !M
  320*KEY 9 VDU10!M !N LIST 740,!M
  330*KEY 10PROCK1!M
  340
```

```
>
>
>
>P.6*9
        54
>G=GET:W%=VAL(CHR$(G))+1:PROC_W_CALL(W%
>
```

```
>
>L.260
  260*KEY 3 W%=4:PROC_W_CALL(W%)!M
>G=GET:W%=VAL(CHR$(G))+1:PROC_W_CALL(W%
>
```

```
>
>
>L.500,550
  500*KEY 6 P."TOP= ";TOP !M
  510*KEY 7 C%=(C%+1)MOD2 !M
  520*KEY 10 PROCK !M
  530
  540DATA MO. 0,REN.,K2,RUN,AUTO,DEL.,
TOP,INVC%,LIST,L.n
  550
>*FX6,0
>
>*GDUMP 1 1 0 0
```

# DIFFERENCE

parameters that are each incremented by plus or minus one from those used in the first.

The effect of this is to create two text windows, one inside the other. By changing the background colour and clearing the screen between defining one window and the other we have a quick and effective way of putting a contrasting border around the final window.

The command VDU17,128 gives a black background while VDU17,129 gives a white one. The window is cleared by the VDU12 command.

It will be seen that these commands are conditional on the variable V%. The purpose of this will be explained later.

In practice the function keys do not call PROCWINDOW directly as it is more convenient for PROCWINDOW to be called from the procedure PROC_W_CALL. This contains a table of 10 sets of parameters for the 10 available windows.

The function keys are programmed to call this procedure, passing it to the parameter W% which lies in the range 0 to 10. This determines which set of parameters are passed to PROCWINDOW.

This table could easily be extended to include any number of parameter sets to provide windows to suit individual taste. The windows 0 to 4 are made available by pressing f0 to f4 respectively.

The other windows are called by pressing f5, which will then accept a parameter in the range 0 to 9 to call any one of the 10 windows.

It could be arranged, however, for this parameter to specify one of 10 separate windows, not including those called by f0 to f4.

There are only 10 red function keys on the BBC Micro. Often, as in this case, there are more than 10 different functions that it would be useful to have on call.

The statement *FX219,138 on line 200 enables the Tab key to be programmed as f10, giving one extra key, but if as many as 20 or 30 different functions are required from these keys then another approach is needed.

As can be seen from the listing there are three separate procedures that define the function keys – PROCK, PROCK1 and PROCK2 – so that they can be programmed in three different ways.

PROCK enables any one of up to 10 different shaped screens to be called by the red keys, while PROCK1 provides a number of other useful programming functions.

These two procedures each program the Tab key to call the other, so that pressing it will make a new set of functions available on the red keys, while pressing it again will revert to the previous set.

PROCK2 on the other hand programmes the keys to provide commands that are useful when accessing information stored on disc or tape, and line 460 provides for these functions to become available by pressing f2.

There is plenty of room for expansion here with any number of key programming procedures structured in the same way, providing additional facilities to suit personal requirements.

With 11 function keys on the go, and up to three different uses for each one, it becomes a little hard to keep track of what key is doing what at any one time.

We can use the window facility itself to create a display at the top of the screen, showing just what each function key is doing at a given moment. This is the purpose of the procedure PROCDISPLAY.

What PROCDISPLAY does is to create 10 small text windows – each with its own border round it – and put a logo in each one relating to the respective function key.

It will be seen that PROCDISPLAY is called at the beginning of each of the three procedures PROCK, PROCK1 and PROCK2.

But since we need a string of descriptions to put in these 10 mini windows, the data pointer is first repositioned to the DATA statement at the end of each procedure by the RESTORE command.

The READ command in PROCDISPLAY will now pick up the correct text for each function key.

Sometimes, when you return to a screen, you might want to keep what is displayed rather than clear it.

For this reason the VDU17 and VDU12 commands are conditional on the value of the variable V% and will only clear a newly defined screen when V% has a value of 1.

This value is set to zero by f6 in PROCK but it is always returned to 1 after a new window is called – this is the

→

*From Page 93*

last line in PROC_W_CALL.

The default therefore is to clear each new window as it is created, so if you don't want it cleared you must first press f6 and then the key to create the new screen.

The red key f7 is programmed by PROCK to alter the list options with the LISTO command. Each time you press it, it flips between LISTO 0 and LISTO 7.

This makes it very easy to list with leading spaces and indentations for general clarity, but without them when you wish to edit lines.

Key f8 lists the program in paged mode – the VDU 10 command drops the listing one line, so that the scrolling up which takes place when you next change screen doesn't result in the loss of any program lines from the top of the old one.

Finally key f9 is "hardwired" in line 320 to list from a specific line onwards. If you are working on a particular section of your program you can edit line 320 so that f9 starts listing from the beginning of that section. This is a useful facility although a little clumsy to set up.

Unfortunately, since LIST is a command rather than a statement, it will not access a variable, so that typing LIST A%, for example, will not work. For this reason, the line number has to be written into the program.

These last two keys are not re-programmed by PROCK1 so that they are always available. The other keys are however, and they give some useful functions.

Key f0 is set up so that, for example, you can get the utility working again after running your program.

It doesn't matter if your program alters the function keys so long as it doesn't change f0, as this is all you need to set up the window and other keys again.

Keys f1 to f5 are fairly self-evident except that in some cases the control and M characters have been deliberately omitted. This permits you to add parameters to the commands before entering them.

Key f6 tells you how much memory has been used. It could easily be arranged for this key to provide more extensive information. This just leaves f7 which is, perhaps, the most interesting key in this group.

It is only practical for a split-screen utility such as this to work in 80 column mode. When using a monochrome monitor this is probably the mode of choice, but with an ordinary TV set, the clarity of the text in Mode 0 is often not too good.

This can be improved by turning the colour control on the set right down. But a much greater improvement can be made by reversing the text and background colours. This is done automatically by f7 as programmed in PROCK1.

Each time you press it, black and white swap over in any windows set up from then on. Many people will find that black text on a white screen is far more acceptable on an ordinary television.

However you can, in addition, create some quite interesting effects by having some screens one way and some the other, all at the same time. PROC-DEMO shows this in action.

**Full listing is on Page 178**

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# WIN a ROM Box

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MICRO PULSE

**WITH each week seeing the launch of some new piece of ROM-based software, many of us are finding there just aren't enough sideways ROM sockets to satisfy our needs.**

Even internal ROM boards suffer from restricted access, a limited number of chips and, often, overheating problems.

However the prize for this month's competition, the external ROM board from Micro Pulse, overcomes these problems admirably.

Fitted outside your BBC Micro, the ROM Box, as it is called, allows you to have up to eight ROMs attached externally to it.

You simply turn a switch to select the ROM you want to use. Only one ROM at a time will be activated, so avoiding irritating clashes where ROMs share commands. A red LED indicates the ROM in use.

One of the ROM sockets is a zero force insertion socket (ZIF), allowing you to swap ROMs simply and safely without damaging them.

And the beauty of the ROM Box is that it doesn't restrict your other hardware options. If you're a real ROM addict you can still have a ROM board inside your micro as well as a ROM box outside.

And, unlike other systems, it works over the Tube so you can use your second processor.

There are three ROM Boxes to be won. All you have to do is to give us the keyword you think is missing from BBC Basic.

For example, suppose the folk at Acorn had missed out PRINT from their version of Basic. You could still manage with VDUs and poking the screen, but life would be difficult to say the least.

Fortunately PRINT was included – but can you think of a useful keyword that might have been included but wasn't? It doesn't have to be a word used in another version of Basic – it can be your own creation.

Just name your keyword and describe its features in not more than 200 words.

## JULY CONTEST WINNER

*WINNER of our Graduate contest in the July **Micro User** was D.J. Reynolds of Kingswinsford in the Midlands.*

*His reason for calling it the Graduate was: "It enables users to graduate from games and get down to business".*

```
              D
I             I
  B A S F D I S C D R I V E   D
    M         C     S   S     A S
      C       S   T       L   T
        O     T R           O A
  1       M   O     M   M L   T
  1 6 B I T P R O C E S S O R E S
      B   O   A       N D     C
  I     I     G T   O   O O   H
    N     T   E   I     S   S N
      T         S   B         O
        E     N       L       L
          G A           E     O
  5 M H Z P R O C E S S O R   G
        X     A               Y
      E         L
      I B M C O M P A T I B L E
                B A S F D R I V E
                      U
```

## Your ROM Box Contest entry form

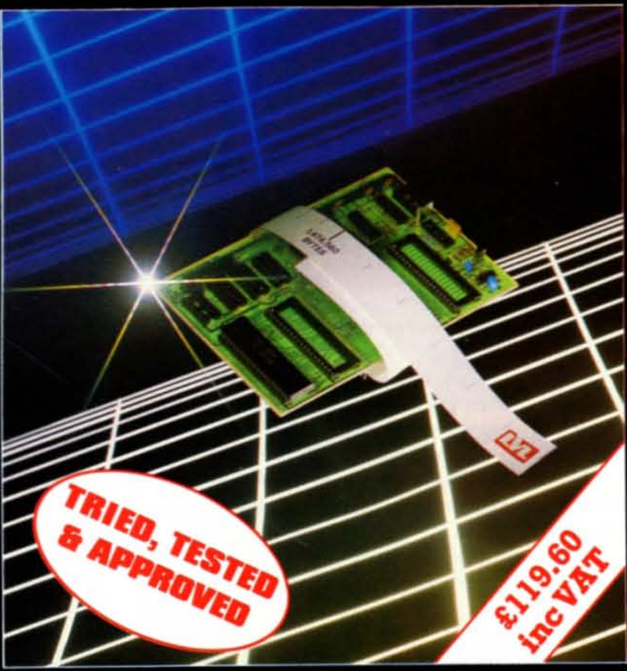
The useful keyword which might have been included in Basic is__________
because (in not more than 200 words:

Name __________

Address __________

**Send your entry to: ROM Box Contest, Micro User, 68 Chester Road, Hazel Grove, Stockport SK7 5NY.**

# DOUBLE MEASURE...



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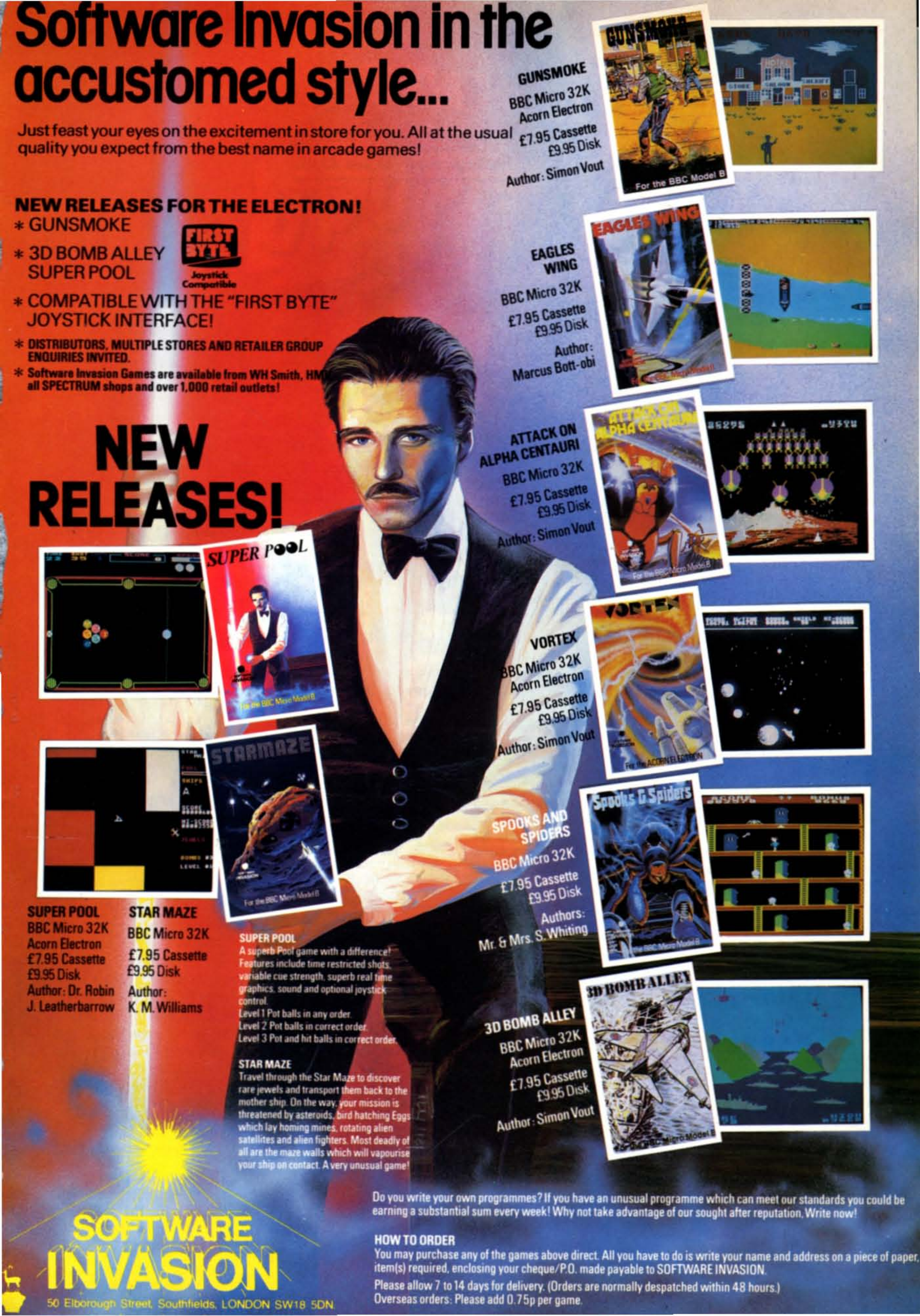

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# Quick to learn, easy to use, that's . .

**MINI OFFICE marks a long-awaited breakthrough in dramatically reducing the cost of personal computing.**

For the first time it makes available to everyone an easy-to-operate version of four of the most popular business computing applications – and at a price anyone can afford.

Never before has a word processor been sold for anything as low as £5.95. Nor a database manager. Nor a spreadsheet. Nor a graphics program.

Yet Mini Office contains them all.

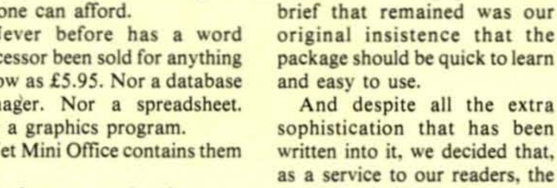
*So how was it done?*

It all started with a suggestion that we should prepare a package to give readers a gentle introduction to the kind of software that businesses were running on their computers.

At that stage there was no intention that it should be an ambitious package. Just a simple program that could be sold at a very low price.

We called in experts in business software programming, told them what we wanted and sat back to await results.

What happened next was totally unexpected. For they all came back with ideas that were to considerably expand our original brief.



A unique feature is the double size text option in both printer and edit mode – perfect for young children and people with poor vision.

*The word processor – with double size characters*

In the end what had been planned as little more than a beginners' guide to word processing, database management, spreadsheets and graphics had been turned into a full scale suite of programs covering all four applications.

In fact the only part of the brief that remained was our original insistence that the package should be quick to learn and easy to use.

And despite all the extra sophistication that has been written into it, we decided that, as a service to our readers, the price should still be kept at the very low figure originally fixed.

*How does Mini Office operate?*

Using the **Word Processor** is simplicity itself. There are none of the cryptic coded instructions that had to be mastered by people learning the early word processors.

You start by selecting the size of type you prefer – either normal or double-size. The latter is a feature that you cannot find on any other word processor.

It is particularly suitable for the partially sighted – in many cases giving them their very first opportunity to use a word processor.

This means they can use a BBC Micro to compose a letter, using the double-size mode, and then print it out using normal size type.

For many people this could be the first time they can send out a perfectly typed letter without outside help.

Primary school teachers are also expected to make great use of the double-size function, both on the screen and on hard copy printouts.

While you are using the word processor three useful pieces of information are displayed across the top of the screen.

They tell you how much time has elapsed since you started using it, the number of words you have written so far, and how many characters you can key in before the BBC Micro's memory is full.

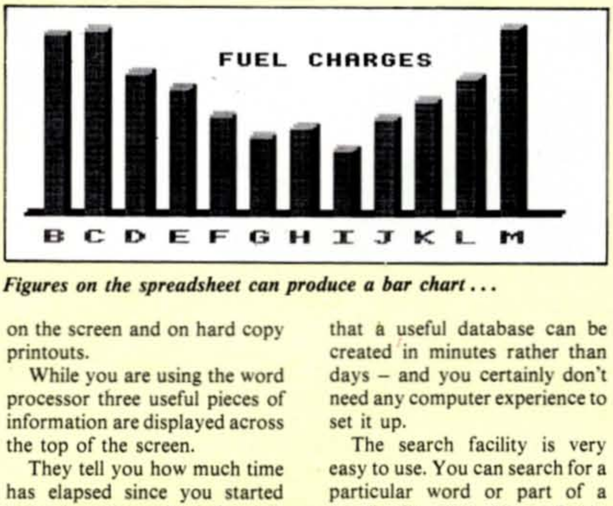
At any time you can press a key which tells you your typing speed. This is a most useful function, and can play an important part in increasing your efficiency at the keyboard.

You can also decide the size of the margin, the line length and the tab positions. Text can be moved from one part of the document to another.

At any time you can preview the text to see how it would look when printed out.

As with all the other programs in Mini Office, your work can be saved to tape or disc and loaded when you want to use it again. It can also be printed out.

The **Database** program can be used to store a mass of information. It can be retrieved, in its entirety or just the parts you require for a particular purpose, whenever you need it.



*Figures on the spreadsheet can produce a bar chart . . .*

The operation is so simple that a useful database can be created in minutes rather than days – and you certainly don't need any computer experience to set it up.

The search facility is very easy to use. You can search for a particular word or part of a word. Or you can order a numeric search – such as telling the computer to find all the numbers greater or less than the one you provide.

You can carry out multiple searches. For instance, if you have built up a mailing list containing a list of names, addresses, telephone numbers, occupations and ages you can ask the database to provide you with a list of teachers living in Liverpool whose ages range from 25 to 30.

One powerful option allows you to replace anything on the database without having to go through the whole lot making amendments yourself.

You could, for instance, instruct it to find each reference to "teacher" and replace it with "lecturer".

The **Spreadsheet** is our version of the program that marked

MINI OFFICE

an important milestone in business computing – Visicalc.

It is often pointed out that this one program alone has helped to sell more personal computers than any other.

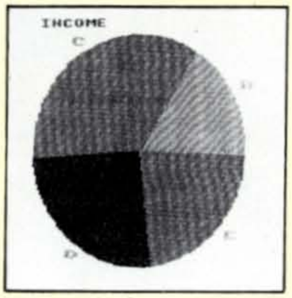
Certainly Visicalc and its derivitives have never been shaken from their position at the top of the list of best-selling business programs.

Yet the concept is very simple – a giant worksheet of rows and columns, only part of which can be seen on your screen at any one time. Into any position on the sheet you can put numbers, labels and mathematical formula.

And when you alter any figure its effect ripples through the rest of the sheet, changing any totals as may be necessary.

The Mini Office version is ideal for home finance, providing you with an effortless means of keeping tabs on your income and expenditure – and enabling you to work out your own budget.

In our Spreadsheet program – as well as in the Database – we have provided a sample file so that you can experiment with it before entering your own data.



*. . . or a pie chart*

One feature we have included which to our knowledge does not exist in any other spreadsheet is a warning device to prevent you accidentally erasing formulae – a very useful precaution.

The **Graphics** program uses the standard business graphics – line, bar and pie charts – in full colour. Which is something not always available on far more expensive graphics packages.

The program uses data you have already prepared on the spreadsheet. You have to identify which set of information you require to see in graph form – such as by indicating which row or column – and then which of the graphs you require.

The graph is then automatically configured exactly as you require it. If you have an Epson-compatible printer capable of producing graphics you can also print out hard copies for a permanent record.

Because our original intention was to produce a package for people new to all these applications, we have produced a fully-detailed, easy to understand manual.

This 32 page free booklet gives clear instructions about how to use all four programs and in itself forms a concise introduction for first-time users.

If you want to start doing more with your BBC Micro than just playing games, this package is your ideal introduction to the four most popular applications for professional computers.

**Send for it today**

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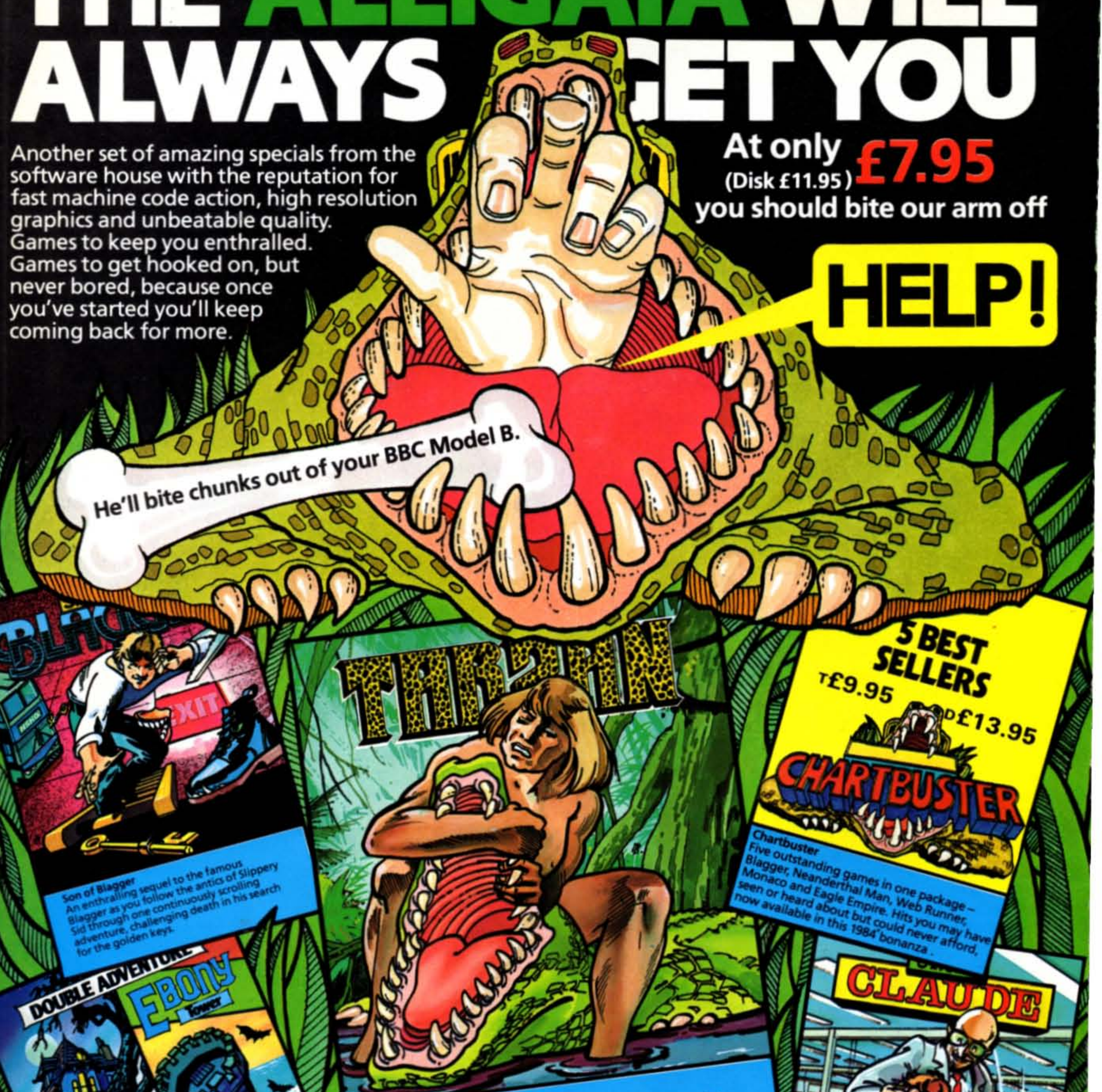

**Son of Blagger**
An enthralling sequel to the famous Blagger as you follow the antics of Slippery Sid through one continuously scrolling adventure, challenging death in his search for the golden keys.

**Chartbuster**
Five outstanding games in one package – Blagger, Neanderthal Man, Web Runner, Monaco and Eagle Empire. Hits you may have seen or heard about but could never afford, now available in this 1984 bonanza.

**Tarzan**
A multi-screen spectacular featuring the Lord of the Jungle in his relentless fight through 4 vicious levels of ferocious blood thirsty beasts and river obstacles in order to save his darling Jane from her awesome fate. Sloppy stuff but well worth fighting for the climax.

**Xanadu Cottage/Ebony Tower**
A treasure trail adventure to places you'd never dreamt of. An unexplored journey to lands unknown, where the fiery dragon lies in wait of the final bloody encounter. Two adventures giving hours of absorbing enjoyment for the bargain price of one.

**Uncle Claude**
Arcade excitement – 11 compelling levels of fast moving action; a nasty evil capitalist in Uncle Claude and poor innocent Micky vainly trying to save his friends jobs – all creates a game that's a must for any games enthusiast.

☐ Tarzan ☐ Chartbuster ☐ Uncle Claude
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SHARP
INFESTED

**MUSIC Tutor** (Garland) is a menu-driven musical composition program meant to be used in conjuction with a teacher or a book about notation.

You can input up to 75 notes either by code, or by using two rows of the BBC keyboard configured as a piano.

With the second method notation appears on the screen as you compose. This is an important and useful feature though a keyboard overlay, rather than a diagram in the manual, would have been an obvious enhancement.

You can listen to your composition – at one of 10 different tempi – edit it, and save it.

The documentation is comprehensive and clearly set out. But there begins the rub. Notes, we're told in the manual, are "correctly located on the clef" (not the *stave*). A slip of the pen? No, the mistake occurs several times, in different forms.

It would appear that the author is no musical theorist – a suspicion confirmed by the program itself.

In input mode the treble clef doesn't encircle the G line of the stave. Not a cosmetic matter – the position of clefs should be part of basic music tutoring.

You then find that the only accidental available is a sharp, though there are good musical grounds for using flats and naturals too.

Indeed, one of the reasons why the screen notation looks unusual is that it becomes so sharp-infested.

Worse, however, is that the sharps appear, incorrectly, above their notes rather than next to them. Formatting accidentals in music programs is difficult, but you can't just sidestep the problem by misplacing the signs.

There is more. The pitch of each note is changed individually, preventing a beginner getting a "feel" for key signatures. You can't experiment with harmonies. There's no choice of clef. Dotted notes can't be input in keyboard mode. You can't input bar lines at all.

The editing procedure is a positive discouragement. If you make a mistake at input you have to go into edit mode. Here, the notes of your tune are presented, in order, one by one – with a cleared screen, so you can't see the notation and edit it at the same time.

Unless you've written your tune down by hand – there's no facility for hard copy – it's virtually impossible to remember which note to change.

And if you switch back to look at the notation you have to start editing again from scratch. Such a user-hostile approach is calculated to create the impression that learning music is a chore.

To cap it all there are two rather serious bugs in the program – I assume they're bugs, not further musical errors. A semiquaver rest is displayed as a semiquaver note and "top" G sharp is drawn with a ledger-line.

The general design parameters of the program are perfectly adequate for beginners. The range of notes, for example, is just over one and a half octaves, and duration is between a whole note and a one-sixteenth.

Within such limits many teachers are waiting for an easy-to-use, musically accurate and creative learning aid. Music Tutor could have fitted the bill. As it stands, it does not.

**Gabriel Jacobs**

# Dig for your life

IN **Digger** (Visions) your only defence against nasties which invade your allotment is a pump. This prods the nasty, causing it to expand until it explodes.

If you only pump it a couple of times then the invader is only temporarily stunned, making a pip noise on recovering.

A more subtle way of killing one is to mine underneath one of several rocks on each screen, dash out of the way, and pray that it falls on a passing nasty.

The screen is neatly presented with score and number of lives left. Below is the allotment viewed from the side so that you can see the soil underground.

The occasional fruit or vegetable appears, yielding a bonus if taken.

Animation is smooth, although with many nasties on the screen it can get a little jerky. The detail of the characters is excellent.

A fun game that would be appreciated by the keyboard basher who thinks there's more to life than Space Invaders.

**Philip Tudor**

G SOFT
MICRO SOFTWARE©
MULTIBASE
FOR THE
BBC MICROCOMPUTER

# Promise unfulfilled

THE preamble of **Multibase** claims that it allows you to create and manipulate a variety of multi-record files to suit your own needs, and is ideal for keeping all your personal records.

All of which sounds very promising.

The main program loads after a short title page and displays a menu giving nine options, to create, display, search, alter, save, load or add to a file, to delete a record or to dump a file.

These options often form the heart of a database but Multibase from G. Soft (Micro Software) offers nothing more, and has some serious omissions.

For a start there is no star command facility. One of the

→

*From Page 103*

most serious drawbacks is the lack of a sort facility. Advanced features such as calculations are not supported at all.

Just to make matters worse there are some trivial but nevertheless annoying faults and bugs. One of the more serious is that you cannot specify the name under which you save the data.

This may seem unimportant until you realise that you have to specify the name when you come to load the file back in!

Adding to a file is cumbersome in that it allows you to type in a string of any length, then checks the length. Deleting a file is very unprofessional since it doesn't tell you what you're about to delete.

Hasn't the author ever heard of the term "user-friendliness"?

Other little niggling faults include the untidy prompts, non-masking of lower case and the very uninformative instruction booklet.

**Shingo Sugiura**

EAGLES WI
the BBC Micro Model B

# Search and destroy

YOUR mission, if you accept the challenge in **Eagles Wing** (Software Invasion) is to fly your aircraft along the river until you reach and, hopefully, destroy the enemies' missile silos and their command centres.

There are plenty of defences along the river, and you need to destroy at least some of these to bring on your in-flight refuelling tanker.

The further upstream you get, the more aggressive the enemy and the more interceptor aircraft there are trying to crash into you.

Press the spacebar and away we go, flying upstream, shooting up the various enemy installations whilst clocking up score and damage to ourselves and using fuel.

Provided we don't crash into the canyon walls, run out of fuel, or get destroyed, when we've scored 10,000 our in-flight service station appears.

Throttle right back, avoid shooting it down, and we dock with it, where-upon not only does it refuel and rearm us, but by some miracle also repairs all our damage. Then on with the mission . . .

There is only one major criticism – the quality of the sideways scrolling. There is a continuous flicker on the left of the screen as the next line to appear on the right (yes, I do mean right!) is put into screen memory.

The scrolling itself is so poor that to anyone stood watching it appears that the screen is out of focus. Compared with other sideways (and, nowadays, even diagonal) scrolling, this is very primitive.

Fortunately, this isn't too noticeable to the person actually playing who is watching only a small portion of the screen.

Probably the only other feature worthy of mention is the "brown" used for the canyon walls, and even this has been seen in other programs from this publisher.

At least in this game I stand a fair chance of keeping my name in the "top 10" table – my reflexes are so much slower than my son's that in most "reaction" games the lowest score he has in the table is usually well above anything I can achieve.

Despite it's shortcomings, I think I will see my son on "Operation Eagle's Wing" at regular intervals in the future.

Now, which key was it for

## QUICK RUNS

### *A first look at some of the latest releases*

**Fun With Numbers:** *An educational suite of four programs aimed at the 4 to 7 year age group. Colourful graphics are used to test a child's ability to count, add and subtract. A final arcade style shooting game tests all three and includes a Hall of Fame.* (Golem).

★ ★ ★

**Star Seeker and Solar System:** *An educational package complete with 28 page manual, Star Seeker plots the most prominent stars from any position on earth. Solar System provides a similar service for the planets and Halley's Comet. Both have the facility to print to an Epson.* (Mirrorsoft)

★ ★ ★

**Hi Bouncer:** *Keep up with Mr Bounce as he leaps around town helping his friends. In this arcade game with four different screens and eight levels of difficulty you'll meet Mr Tall, Mr Lazy, Mr Bump, Mr Snow and many other favourites, but your tactics on each screen are different.* (Mirrorsoft)

★ ★ ★

**Galaxy Raiders:** *Avoiding storms of asteroids you pilot your starship into 3D space engaging the Arian fleet which is intent on your destruction. You must also defend your starbases, essential to your survival, by hyperwarping to selected sectors. Your aim is take the shortest time possible with the minimal amount of refuelling.* (Visions)

★ ★ ★

**Uncle Claude:** *Sneaking into the electronic warehouse after dark you must prevent the boss, Uncle Claude, from making a profit. He is out to maximise his profits by selling goods at excessive prices, and you have been hired by the union to ship them to the shops quickly, so as to avoid job losses. You must steer clear of the prickly acorns and Claude himself as you endeavour to load a variety of electrical goods onto the conveyor belt.* (Alligata)

★ ★ ★

**Spitfire Command:** *Pit your skill and daring against the Luftwaffe as they prepare to clear the way for the invasion of Britain. You view the opposing aircraft from your cockpit as they bank and turn, attempting to destroy you before your rapid machine gun fire blows them to pieces.* (Superior)

★ ★ ★

**Star Striker:** *Controlling a rocket equipped with lasers you must defend yourself against circling aliens. To add difficulty to the task you must also avoid asteroids and fireballs. Can you dock with two additional stages of your rocket to increase your fire power or are you doomed to lose each stage in a futile attempt?* (Superior)

★ ★ ★

**Starship Discovery:** *A member of the crew of Starship Discovery, your job is to undertake repair work on the outside of the ship. At your disposal is an EVA pod which, under simulated test conditions, you must pilot through eight levels of difficulty.* (Alligata)

★ ★ ★

**Laser Reflex:** *Left in sole charge of a remote asteroid refuelling base, your only defence against invading drones bent on plundering the fuel supplies is a powerful laser cannon. It is fast, deadly and uses a giant mirror to angle your fire power.* (Talent Systems) shooting up ground installations? Right, away we go again ...

**Michael Gilbert**

## Blast the dams

HAVE you ever fancied yourself as Guy Gibson flying your beloved Lancaster equipped with Barnes Wallis's bouncing bomb? Look no further than Alligata's **Dambusters.**

You fly over landscape made up of a single green line ... but use your imagination. The aim is to destroy as many dams as you can before enemy fighters get you. The dams are also heavily protected by anti-aircraft guns.

So you must dodge the flak, destroy the fighters, and aim and drop your bomb too.

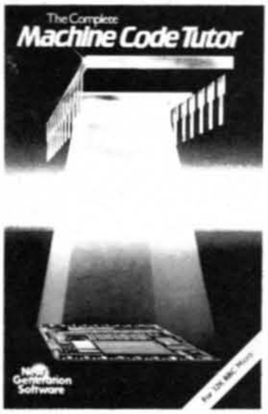
The bomb sight is the ingenious dual spotlight system. You try to get both beams of light as close together as possible on the surface of the water.

This is a lively and interesting simulation. The game isn't easy to master and the number of keys to be pressed – seven – is rather overwhelming.

The sound isn't all that exciting and there are no bonus screens or real game variations apart from a general speeding up and the appearance of more enemy planes.

An exciting and involving game, but not as addictive as one might expect.

**Dave Carlos**



## Assembly language unveiled

**THE Complete Machine Code Tutor** (New Generation Software) is not a machine code tutor at all, but is in fact a very good suite of programs that will teach you how to use, and write in, assembly language.

It takes the total novice from basic principles right up to relatively complex programs, explaining each assembly code instruction, and giving a demonstration program.

Once loaded the clinically clean Mode 7 display screen keeps you well informed of your progress through the lessons. Once each stage is completed it automatically steps on to the next one.

It is fairly easy to get to your desired program, even out of sequence. This is achieved by using the Return key to step you down the page.

Much of the program is automatic, only requiring a specified key depression to start the next activity. The very neat coloured display makes keying errors minimal, but even so the crash proofing is excellent.

The lessons seem a little out of order but it isn't that confusing, although some of the text does seem a little ambiguous in places and in some instances may require a second read to understand fully the following example.

Each stage of the package – from New Generation Software – has a descriptive text, explaining an instruction code, or a group of codes. It then provides a working program, which makes the theory become fact.

The code of the example programs is single-stepped with the Return key, allowing a constant on screen display of the 6502's registers and flags.

The screen display can be altered from a simple to understand form to a much more comprehensive display, showing the actual addresses that the code is working at.

Another feature is the ability to flip between decimal and hex notation – a great teaching aid in itself.

On the whole this dual market package should be as useful in the school as for the enthusiastic home user. My one main criticism is that there are no self assessment questions, which would be very beneficial.

Accepting the limited size of the available memory in this package it can be used as a development tool for assembly programs, and as such does not fall into the category of a "useful only once" program.

**Garry Marsh**

## Learning by building

NOT exactly history, not quite English, some maths certainly – but a lot of enthusiastic discussion and cooperation. That's **Fletcher's Castle** by Fernleaf Educational Software.

This educational game is aimed at the 8 to 12-year-olds. Simon Fletcher, a Norman knight, has a grant of land on which he has to build a motte and bailey castle.

He can recruit local workers to help his soldiers but they cannot be trusted alone. The object is to divide the workers and soldiers into groups to complete six tasks and get the castle built in 10 days.

The instructions are clear and well presented, but there are rather a lot of them to remember and children playing this game for the first time needed prompting.

They did not like leaving this game in the middle. It takes at least half an hour to play it right through and they were a bit disappointed when they realised how difficult it was to complete.

Sound is not used – perhaps a good thing in a busy classroom – but the graphics could be much more detailed and the castle should be drawn faster.

The worksheet provided can be copied for a permanent record.

The object of the program is to encourage language development and logical reasoning. It does this very well and a teacher could also use it as a mathematical aid.

Worth a place in the junior school program library.

**Alison Cernyw-Hughes**

SUPERIOR SOFTWARE

## Battling for Boris

BORIS has had his home raided by the underworld creatures who have stolen most of his possessions.

As you can imagine, Boris is quite peeved and sets out to retrieve his valuables. Your task is to guide him through the underworld and fight off the creatures that await him there.

When **Boris in the Underworld** (Superior Software) starts, Boris appears on the left hand side of the screen and a large number of nasties appear. You have to shoot these before the underworld fiery walls engulf you.

Each time you successfully fight off a horde, you will get one of Boris's possessions back.

As the game progresses, it will get harder to kill the creatures, indestructable discs will start flying around the cave and the fiery wall will move in faster.

The graphics are sharp, characters are colourful and well defined and the animation is

# SATAN'S CHALLENGE

## **or (Nevil Rides Out)** A Black Magic Adventure

Dare you take up the challenge laid down by the most evil and sinister of all beings . . . the devil himself.

If you do you will find yourself alone and at the mercy of the twisted fancies and whims of a cold and calculating mind.

Occult forces are threatening the lives of those near and dear to you. Their only salvation rests in your hands but in accepting the challenge your own existence is put in severe peril.

In taking up the challenge you have to find the TALISMAN and locate a pentagram which then has to be prepared for the final rite. In the mean time dark forces will be opposing you making a difficult task almost impossible.

Do not allow yourself to the lulled into a sense of security for it will be short lived.

Many have gone before only to swell the ranks of the damned.

This is the latest adventure from the stables of Microtest and has been written with the acclaimed features of other adventures in mind eg save facility, quick response, simple but extensive commands, a mixture of logical and fiendish problems to solve.

Be warned this is an easy adventure to get into but devilishly difficult to end.

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This exciting new ROM from Microtest will enable you to get all sorts of new characters and fonts from your BBC Computer. Once you have produced your masterpiece on the screen, all you have to do is use the inbuilt screen-dump utility to produce a hard copy onto paper.

Typing '*HELP FONTS' gives a list of available fonts and the blocks of characters which they replace.

Available fonts are:

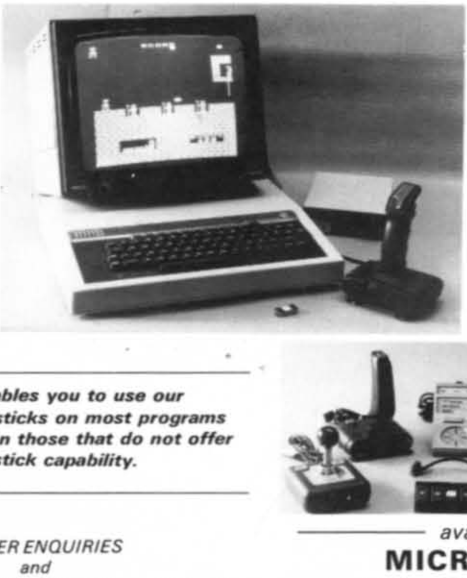
| | |
|---|---|
| ***Accents** | Accents and miscellaneous. |
| ***Block** | Small capitals. |
| ***Data** | Like the bottoms of cheques. |
| ***Greek** | It's all Greek to me too! |
| ***Joined** | Standard capitals with joined up lower case. |
| ***Maths** | A mix of until now unobtainable Mathematical symbols. |
| ***Miscellaneous** | A few oddities which often are very necessary. |
| ***Thick** | Thick text (for MODEs 0&3) to enhance 80 column mode. |
| ***Thin** | Thin text (for MODEs 2&5) which makes modes 2 & 5 much more readable or perhaps "READABLE". |
| ***Vertical** | For labelling graphs. |
| ***MODE 8** | Ten column multicolour, memory-miserly mode. |
| ***S DUMP** | A dump facility which will produce a screen dump of any MODE from 0 to 8 (including a text only dump in MODE 7) on an Epson, Star, CTI CP80 or MT80. |

The ROM uses absolutely NO user memory and can be used with word processors etc. as well as normal BASIC programs. The DUMP utility will produce positive or negative graphics and will also rotate the picture produced through 90° as well as being able to position the picture anywhere laterally across the sheet of paper.

***£17.50*** *inc VAT (add 50p p&p)*

# Microtest Starstick ROM & Joystick Package

Now available the Starstick ROM and Joystick. This comes in three forms:



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**(B) The Starstick ROM and Quickshot II Joystick**
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**(C) The Starstick ROM and patch lead, choose your own Spectrum/Atari style joystick**
***Price 15.25 + VAT = 17.54***

*Post and Packing £1.00 inc. VAT per item*

This enables you to plug the Rapid action self centring joysticks until now only available for the Spectrum/Atari/CBM machines into the user port of the BBC. Model A users please note NO ANALOGUE INTERFACE REQUIRED.

Disc Users Note – pressing BREAK, SHIFT-BREAK or CONTROL BREAK does not modify or destroy the STARSTICK software so Disc Users please feel free to Boot!

The software patch provided in the ROM is interrupt driven and adds the following commands to your computer.

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★ STICK turn on the STARSTICK ROM
★ NSTICK turn off the STARSTICK ROM
★ SETSTICK set up joystick to users spec
★ SAVE "NAME" 140 160 saves your user-key protocols
★ ADVAL emulate standard analogue joysticks
★ PAUSE define key to Freeze game
★ NPAUSE turn off ability to freeze game
★ "NAME" predefined key protocols set up for software houses programs
★ HELP KEYS displays currently selected key protocols
★ REPEAT enables auto-repeat fire
★ NREPEAT disables auto-repeat fire

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Access

Large picture shows BBC Computer System and a Quickshot II Joystick. Small inset just a few of the joysticks that will work with the patch lead. Screenshot by kind permission of SUPERIOR SOFTWARE

**All MICROTEST ROMs are fully TUBE® compatible. (TUBE® is a reg. trademark of Acorn Computers).**

*From Page 105*

suitably entertaining.

Although the sound could have been a little bit more imaginative, the whole thing is generally of very high standard and all the little professional touches such as freeze, sound off/on option and high score table are there.

The only faults on the technical side were the lack of a quit facility and the inability to switch sound off in the middle of a game.

However, it is addictive and will appeal to a lot of arcade game freaks.

**Shingo Sugiura**

# Not too friendly . .

**TEXT Editor** is attractively packaged in a videocassette style plastic case, but unfortunately the software inside – from G. Soft – is not up to the same standard.

Once the program has loaded, the user is asked to set the page width. If no number is entered this defaults to 80 columns. Setting page width to 60 columns results in the right-hand 20 columns being shaded.

This is merely a visual indication of the length of the line. Any text entered beyond the end of the line will appear on the line below on the screen, but will appear in its true length when sent to a printer.

G SOFT
MICRO SOFTWARE
TEXT EDITOR
FOR THE
BBC MICRO

It is therefore essential to press Return at the end of each line so that each is assigned a new line number and the printed text has the same format as that displayed.

The line length setting causes havoc with another of the editor's facilities. By pressing f4 at the start of a new page the user's address will be printed at the top of the page.

When using any page width setting other than 80 columns, the address will appear disjointed on the screen and will always be sent to the printer in 80 column format despite the width setting of the bulk of the text.

I experienced some difficulty when attempting to save a page of text to tape merely through a lack of user friendliness. When asked whether I wanted to load data I could get no response from the program when pressing either Y or N.

I had resorted to listing the program before realising that the program was only checking for an upper case reply. This problem occurred throughout the program.

Text can be formatted using the Centre command, which moves any text to the centre of the line, such as for headings, and the Indent command which can be used to indent text at the beginning of a new paragraph.

Indent should not be confused with TAB – which is not implemented – as pressing indent in mid-line will erase the text at the beginning of the line.

Printer control codes can be embedded into the text by enclosing them between square brackets.

If one disregards the ambiguous information referring to the insertion of the user's address, then the accompanying booklet is quite good.

There is also no need to make a note of the function key tasks as these are displayed in the top few lines of the screen.

Overall the package – which costs £9.95 – is a little rough around the edges. If it was re-written to implement optional double spaced printing, a TAB key, and even a simple search and replace routine, then it would be worth consideration as a text editor for the user who merely wants to send the occasional letter and keep a copy on tape for reference.

**Jon Revis**

# Yoyo ousts the laser

**FRAK** (Aardvark) falls fairly and squarely into the cute category. How else can you describe a game in which the hero, caveman Trogg, wanders through a ladders and levels type landscape collecting jewels, bulbs and keys?

And then when he encounters the inevitable Scrubbly monster what does he do? Does he blast it with his sabre tooth laser cannon? No, with a deft flick of the wrist he smacks it right between the eyes with his yoyo!

You begin with three Troggs

*Turn to Page 110*

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***All prices on this page have been reduced by 10% (software) and 5% (hardware)***

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*From Page 107*

and a time limit of two minutes per Trogg in which to yoyo as many monsters as possible while collecting jewels for bonus points.

Should you collect all of the keys on one landscape then you receive a time bonus and are moved on.

Your task is hindered by a constant hail of daggers falling from above and balloons rising from below. Should either of these items touch Trogg he cries "Frak" – a caveman derivation of "Oh bother" – and promptly dies.

As you become a crack shot with the old yoyo you can amass further bonus points by hitting the daggers and balloons.

The graphics are superb. Aardvark has used the Mode 1 screen and created large, highly detailed, cartoon style characters.

Unfortunately the size and complexity of the characters is probably responsible for one of the program's few failings. When it was called upon to move Trogg, a dagger and a balloon, the speed and fluidity of the animation suffered visibly.

Another irritation, probably less excusable, is the standard of the collision detection routine used.

Several times I outmanoeuvred a falling dagger by a good 3mm yet Trogg still yelled out "Frak" and died on me.

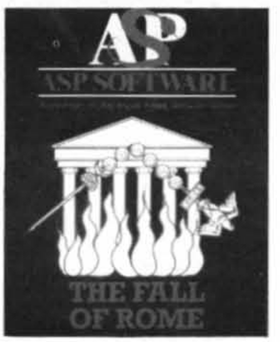
Despite these minor drawbacks, Frak is a superb game that will take you hours to master. **Jon Revis**

# Now don the purple

TAKE command of the Roman Empire in 395 AD, and by raising and moving troops – and seeing that funds are available in the correct place to pay and maintain them – prevent the destruction of your Empire by the surrounding tribes and armies.

**The Fall of Rome** (ASP Software) lasts 12 turns, each representing five years.

You find you need paper and pencil, because the printed map supplied, while giving the names of the provinces within the Empire, provides only the names of the surrounding tribes and not the names of their countries which you'll need. You should list these as they are displayed on the screen.



The author of this ASP Software game has done a good job of simulating history, because, while the Eastern part of the Empire can be held (and even expanded) fairly easily, it is almost impossible not to lose a fair number of the Western provinces early in the game, even on level 1.

But don't despair, you can retake them later.

Two points on which the rules make no comment. If you have insufficient funds in a province to maintain the legions present at the start of the turn, some troops will desert.

In the unlikely event that you happen to accumulate more than 255 units of cash (including the start-of-turn income) in any one province, the taxman will immediately collect 256 from you – due to the fact that all data (except the date) is held as a series of one-byte numbers.

This method of holding the data has one – I suspect unintended – benefit. When you have completed your 12 turns and the game ends, typing RUN does not reset anything except the date, so you can continue from where you left off!

Fancy another 60 years as Emperor?

The only real complaint I have is that there is no provision to save a position and continue later from that point. This facility should be considered a must in any game such as this likely to last over an hour. Don't start a game while having your bed-time cuppa, which is what I did the first time I played it.

The various colour combinations in this program worked fine on my monitor, but on the various TV sets I used the red-on-green maps and the red-on-blue and blue-on-red of much of the text gave a blurred, out-of-focus effect.

Despite the moans – which are really only about frills – the Fall of Rome is as good as any other game of its type, and better than most. **Michael Gilbert**

# *Keeping tabs on the cash flow*

**CASH Book Accounting** and **Final Accounts** by Gemini make up a package suitable for use in a cash-based business, replacing the conventional manual cash book.

Using the first program details of all amounts spent and received – both cash and bank transactions – are typed in and the program will produce a trial balance at any time.

The Final Accounts program produces a complete trading and profit and loss account and balance sheet. The programs do not attempt to maintain debtors' or creditors' ledgers.

The programs cost £59.95 each, although they are cheaper if bought as one of Gemini's combination packs.

Cash Book Accounting is generally well-designed and easy to use.

The only time that much technical accounting knowledge is needed in this program is when the journal option is used to make adjustments to the accounts.

As adjustments can often be left until the end of accounting periods, a user can get on with recording the day-to-day cash and bank transactions, leaving the adjustments for an accountant to deal with later.

Ensuring that data entered is accurate and complete is a very important aspect of all computerised accounting systems. This program uses the common method of batch control to minimise the chance of errors getting through.

Gemini state that this program provides a full audit trail, on the assumption that the user always prints out batch summaries. However, even if this were done I think that using the audit trail would be very difficult.

Each account, including those for cash and bank, records only the current balance and no detail is kept on file of the transactions which have resulted in that balance.

The batch detail printouts would, of course, show invoice details and so on and would help.

However, over the course of a year there are likely to be many such printouts each containing many transactions, and each would have to be examined to see if it contained anything relevant to the account in question.

In the case of a busy account made up from many transactions, this would be a long process.

A solution to the problem would be if after each set of updating runs a printout were produced which would show for each account, the brought forward balance, details of all amounts updated in those runs and the resulting carried forward balance.

This printout would show the transactions summarised by account which would make checking much easier.

With the Final Accounts program the user can ask at any time for a balance sheet and profit and loss account along with comparative figures.

The layouts of the balance sheet and profit and loss account are quite adequate for small businesses and these documents can give an easily obtained picture of how a business is doing. **Ken Garrett**

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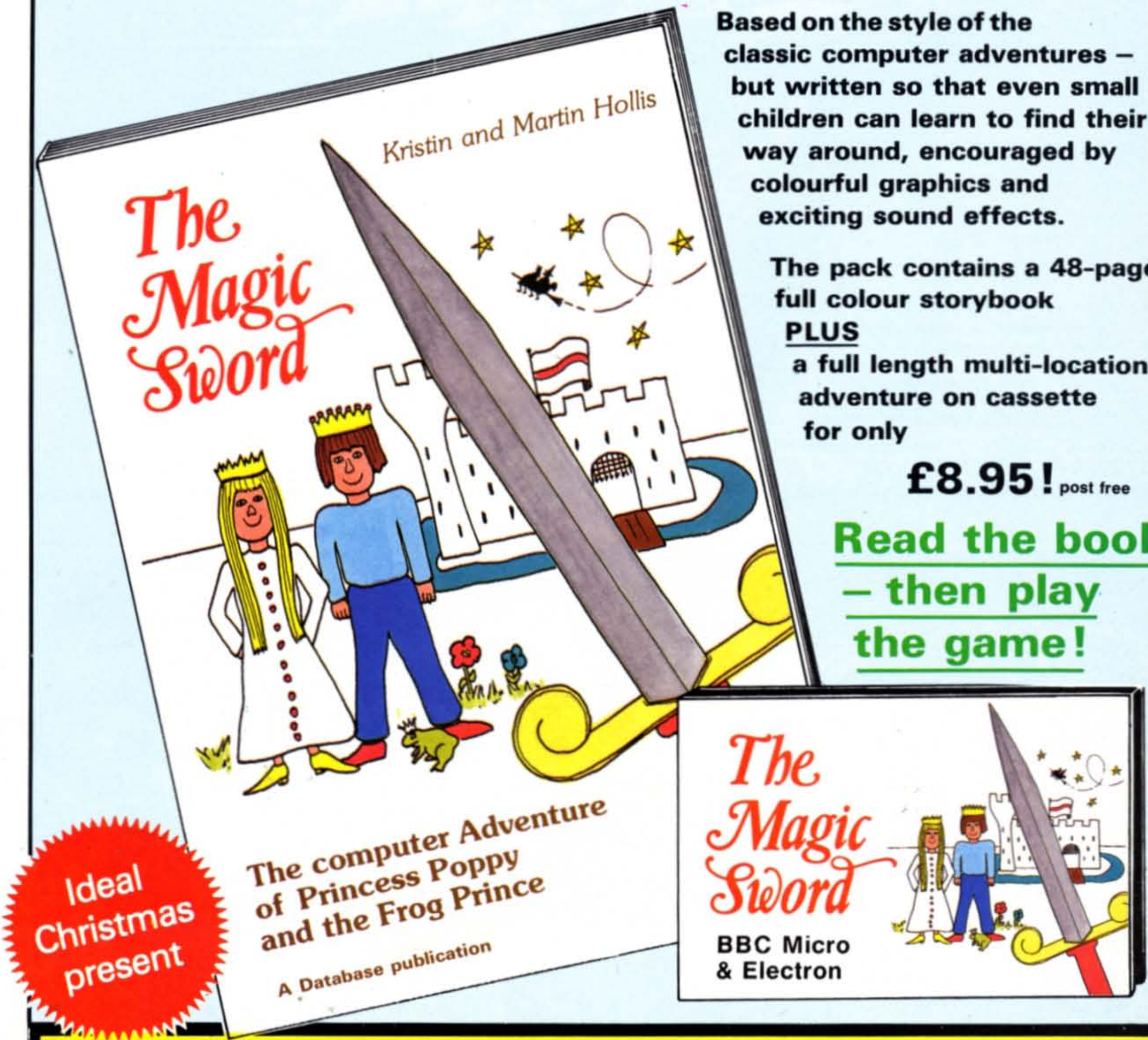
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LOCK UNLOCK ARCHIVE RETRIEVE

| | |
|---|---|
| *BLIST | Produces a "prettyprint" listing, by splitting up multistatement lines. |
| *BFIND | Finds all occurrences of a string within the given range. |

```
>*BFIND C_
100PROC_FLUSH
200PROC_DELAY(2)
```

| | |
|---|---|
| *BREPORT | Indicates the exact position within a line at which a BASIC program fails. |
| *BSR | Global search and replace for any string including keywords. |
| *BEQUIV | Allows passing of array names to PROCedures and FuNctions. |
| *BOVERLAY | Allows simple overlaying of program sections. |

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|---|---|---|---|
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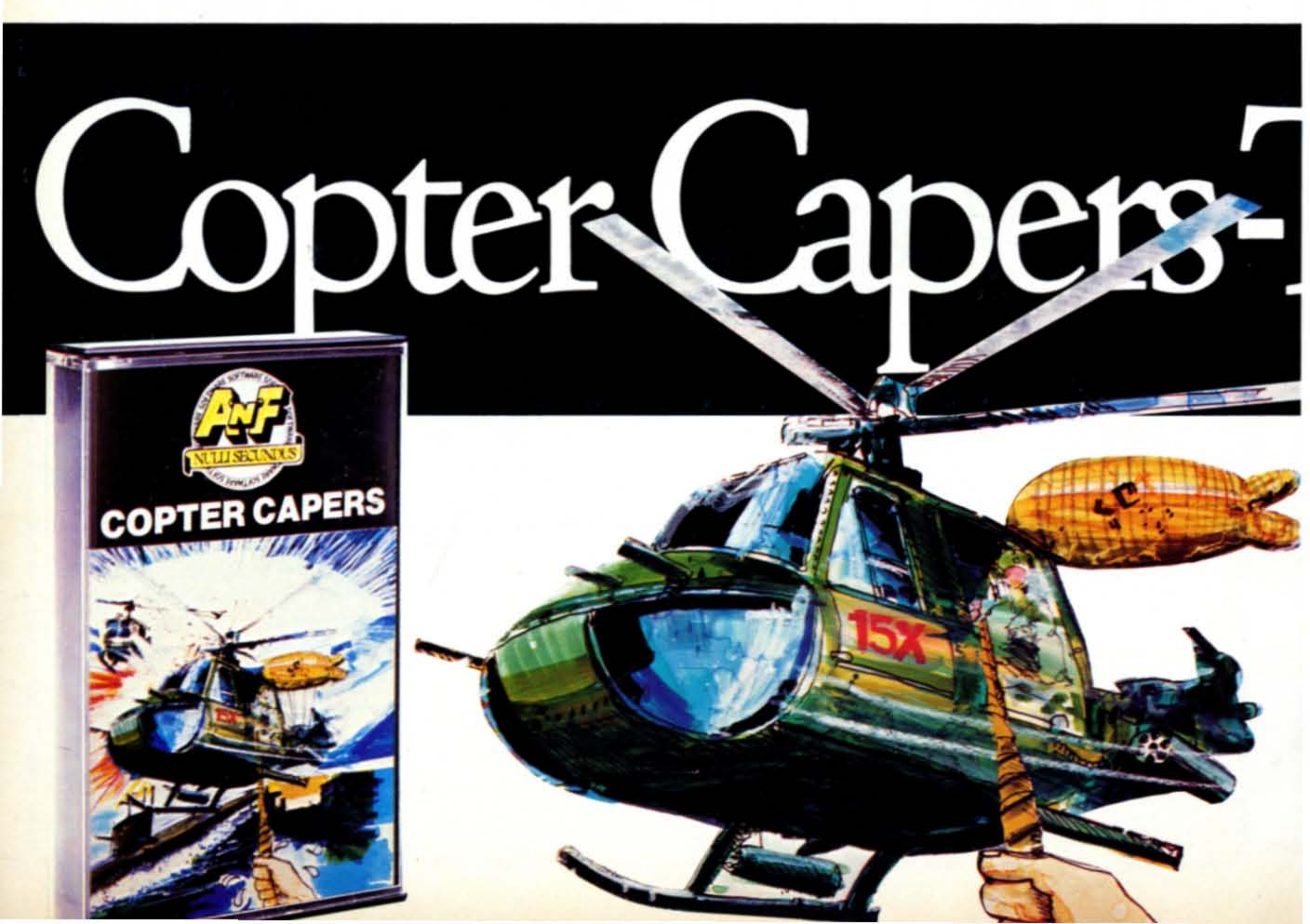

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# Beware Nogrob's Goulogs

### Put your micro skills to the test in PHIL BROOKS's fearsome escape game

**NOGROB the evil magician is worried. Until now the strength of his magic has been unchallenged, but he has heard of your skill with the BBC Micro which he fears is more powerful than his spells.**

Unfortunately he has managed to capture you, along with your micro, and has imprisoned you deep inside the caves beneath his castle.

However Nogrob is completely mad and decides to set you a test. If you complete it successfully you can escape and BBC Micro users everywhere can breath again.

If you fail you are doomed to spend the rest or your life in the caves, and Nogrob's magic will remain all powerful.

Your task is to fly a balloon from one end of the cave system to the other. If you touch the sides, the balloon will burst, and you will have failed.

Nogrob is able to make the balloon rock from side to side with his magic, but he doesn't think this will stop you, so he has positioned several of his henchmen – Goulogs – in parts of the cave.

They will blow you against the sides if you get too close to them. If you don't keep the balloon moving Nogrob's magic will become too strong and down will go the balloon.

There are four levels of play, each faster than the previous one. As the levels increase the Goulogs become more dangerous and numerous and they blow harder. You have the choice of playing at a fixed level or with a progressive level increase after each successful run.

You have six lives and there is a speed bonus. You gain a life after each successful run.

Remember keep away from Nogrob's Goulogs and keep the balloon moving. BBC Micro users everywhere are counting on you!

## PROCEDURES

| | |
|---|---|
| **PROCbal1** | Prints the balloon moving left to right in rocking motion. |
| **PROCbal2** | Prints the balloon moving right to left in rocking motion. |
| **PROCstr1** | Prints the string when balloon is rocking left to right |
| **PROCstr2** | Prints the string when balloon is rocking right to left. |
| **PROCmap** | Draws course in specified colour. |
| **PROCbcheck** | Checks to see if the balloon will hit the sides of the course during the rocking motion. |
| **PROCmovecheck1** | Checks to see if balloon will hit the sides of the course when moved from the keyboard while rocking left to right. |
| **PROCmovecheck2** | Checks to see if the balloon will hit the sides of the course when moved from the keyboard while rocking right to left. |
| **PROCbang1** | Causes balloon to pop when called from PROCmovecheck1. |
| **PROCbang2** | Causes balloon to pop when called from PROCmovecheck2. |
| **PROCbbang** | Causes balloon to pop when called from PROCbcheck. |
| **PROCgoal** | Plays "Congratulations" and works out the bonus scored. |
| **PROCface1** | Prints Face1 at top centre and bottom right of course. |
| **PROCface2** | Prints Face2 at top left of course. |
| **PROCblow1** | Prints breath from mouth of Face2 and causes balloon to be blown away. |
| **PROClives** | Records number of lives. |
| **PROCmover1** | Moves balloon up, down, left and right when balloon is rocking left to right. |
| **PROCmover2** | Moves balloon up, down, left and right when balloon is rocking right to left. |
| **PROCdel** | Speeds up movement of balloon as the level increases. |
| **PROCstart** | Sets up the starting position of the balloon and prints the initial parameters on the screen. |
| **PROCinst** | Prints instructions and sets up the level of play. |
| **PROCend** | Prints final score and Hi-score table. |
| **PROCblowcheck1** | These procedures check to see if the balloon is blown by Face1. |
| **PROCblowcheck1plus** | |
| **PROCblowcheck2** | These procedures check to see if the balloon is blown by Face2. |
| **PROCblowcheck2plus** | |
| **PROCfanfare** | Plays "Blow the man down" when a Hi-score has been achieved. |

## VARIABLES

| | |
|---|---|
| **HI1%** | Hi-score, level 1. |
| **HI2%** | Hi-score, level 2. |
| **HI3%** | Hi-score, level 3. |
| **HI4%** | Hi-score, level 4. |
| **HI5%** | Hi-score, progressive level. |
| **S%** | Your score. |
| **BON%** | Bonus achieved when a goal is scored. |
| **LIV%** | Number of lives. |
| **LEV%** | Level in play. |
| **A** | Local variables used in PROCmap to read data and set up the course. |
| **B** | |
| **C** | |
| **D** | |
| **E** | |
| **XA%** | X coordinate of balloon when it pops on side of course. |
| **XB%** | Y coordinate of balloon when it pops on side of course. |
| **XF1%,YF1%** | X and Y coordinates of Face1. |
| **XF2%,YF2%** | X and Y coordinates of Face2. |
| **A1%,B1%** | X and Y coordinates of breath from Face1. |
| **A2%,B2%** | X and Y coordinates of breath from Face2. |
| **P,Q** | Local variables used in PROCblowcheck1, PROCblowcheck2, PROCblowcheck1plus, PROCblowcheck2plus to generate random variables to determine if Face1 and Face2 blow the balloon. |
| **J%,K%** | X and Y coordinates of the balloon in PROCblowcheck1, PROCblowcheck2, PROCblowcheck1plus, PROCblowcheck 2 plus. This is transferred to PROCblow1 and PROCblow2 if the balloon is blown. |
| **F,G** | Local variables used in various time delay FOR ... NEXT loops. |
| **M%** | Level chosen. If progressive play is chosen then M%=5, otherwise M%=LEV%. |
| **X%** | X coordinate of balloon. |
| **Y%** | Y coordinate of balloon. |
| **B%** | Relative X coordinate of balloon during rocking action. |
| **C%** | Variable used in the main loop to determine the direction of movement of the balloon's rocking action. |
| **Z%** | Number of times the balloon has rocked since the last keyboard input. |
| **I** | Ascii value of input. |
| **W%** | X coordinate of balloon during blowing. |

**Keys**

| | |
|---|---|
| A | *moves the balloon up.* |
| Z | *moves it down.* |
| ← | *moves it left.* |
| → | *moves it right.* |

Full listing starts on Page 181

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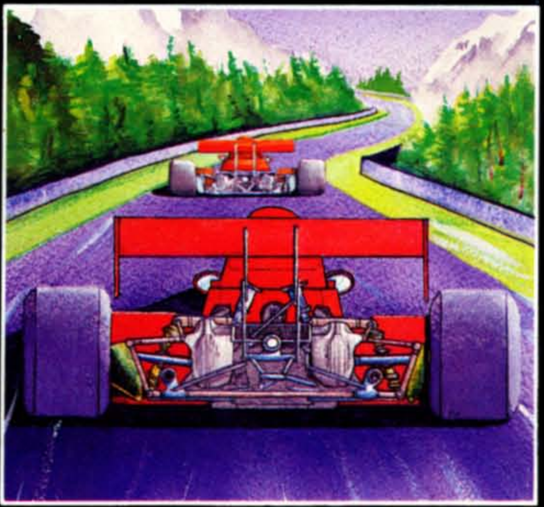

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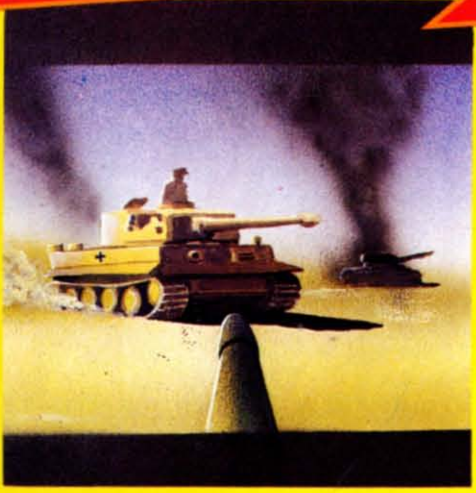

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*Cambridge Microprocessor Systems*

# The fight for the 6809 was one I'm glad I won!

**TWO types of second processor are available for the BBC Micro. The first looks and feels like the computer you are used to. You can program it in Basic or any other language you have and all the commands will be the same.**

You will, however, get more room to program in and the programs will work faster as the second processor does the thinking while your original computer handles the input and output.

The Acorn 6502 second processor is the only one of this type.

The second kind converts your BBC Micro into a totally different computer able to run different operating systems, languages and machine code.

All other second processors fall into this category. Among the pack the 6809 second processor from Cambridge Microprocessor Systems must surely stand out as one of the best.

In fact when it came into the office for review the editor and I had a fight to see who was going to review it. I'm glad to say I won.

The advantage of using a second processor is that you already have the expensive components of a computer system – the disc drives, keyboard and display – so you can just glue on another engine and away you go.

The 6809 second processor is built on a 4in × 8in board and plugs into the Tube connector on the underside of the computer.

It consists of a 6809 microprocessor running at 1MHz, 64k of dynamic memory, a 4k eprom operating system and a bus expansion socket. It also contains two discs and documentation.

On the software side there is a monitor, disc operating system and a 6809 editor and assembler.

To get the processor up and running you simply place in the link disc and press Shift and Break. The screen then comes up with a menu which allows you to format a disc for the new processor, enter a 6809 machine code monitor or run the disc operating system.

As you will see, the system needs discs formatted differently from the normal BBC format so there is no chance of getting the programs on them confused.

The machine code monitor allows you to do all the usual things machine code monitors normally do. You can examine and change memory locations, load and dump blocks of memory as well as executing a program. This in itself is all very well, but is not spectacular.

When you enter the disc operating system however things begin to happen. This is called Flex and has a prompt of three plus signs (+++).

At this point I must declare an interest in that Flex was the first disc operating system I ever used on a micro. It was way back in the dark ages of 1977 and ran on a South West Technical Products 6800 system.

At the time I thought it was nothing particularly special as it did all I wanted it to do in a simple straightforward manner. It was only later when I was exposed to other systems like CP/M and the BBC disc filing system that I appreciated how good Flex really was.

The major part of the operating system is stored on disc and when you type a command it will execute a file with that name (plus an extension of CMD).

This technique is known as overlaying and means that the operating system takes up a minimum amount of memory. Also command names can be changed simply by changing the file name.

In addition you can write new commands, save them on a file and include them on the system disc. They become as much a part of the disc operating system as any other command.

One command I miss on most other systems is the COPYNEW command which will copy only files that are not already on the destination disc.

Flex has been running for a number of different machines for many years and so there is quite a bit of software available to use with it. This means you can now run languages that have not yet been implemented on the BBC Micro.

Among those available – at extra cost of course – are Cobol (for those of you with commercial interests), Pascal (for the real structured programming nuts) and PL9 (for system developers).

For machine code freaks there is a bunch of utilities as well as cross assemblers which cover most of the available microprocessors.

One that caught my eye in the literature was the 6502 simulator and translator. This allows you to convert 6502 source code into 6809 source code or simulate the running of it. Also, if you really insist, you can get an extended Basic.

It should be noted that these languages do not come free with the second processor and have to be bought separately.

For those of you not familiar with the 6809 microprocessor, it is generally known as the programmer's processor.

The instruction set is very orthagonal, which is jargon for sensible and consistent. It has two 16 bit index registers, two 8 bit accumulators and two 16 bit stack pointers.

The designers, Motorola, say it is a bridge between the 8 bit and 16 bit world – although if Sinclair were selling it he would call it a 16 bit processor.

Also, unusually for 8 bit microprocessors, it has a multiply and divide instruction. Although it is only running at 1MHz it will outperform a Z80 microprocessor running at 4MHz.

For the purposes of this review I was also loaned a copy of the language PL9. The syntax of this is very much like a cross between Basic and Pascal with the

→

*From Page 119*

advantage that it is compiled. That is, once you have written the program it is turned into 6809 machine code.

This machine code is then executed, resulting in an increase in speed over the normal interpretive method. In addition, the machine code produced is "ROM-able", which means it can be placed into a ROM or eprom and built into a dedicated system.

A dedicated system is a micro which will do only one task, typically controlling something like your central heating or a vending machine.

Normally a dedicated system requires programming in machine code and this leads to long development times. However if all or most of the program can be written in a high level language the development is greatly enhanced.

I believe Cambridge Microprocessor Systems can also supply development modules for dedicated systems.

Documentation is usually a weak point in most products but here it is quite good. There is an A5 size spiral bound manual about the software which comes with the processor (Flex and the Editor Assembler).

Also there is a 16 page slim volume detailing information specific to the hardware as well as examples of how to tap the unique features of the BBC Micro.

The documentation that came with the PL9 language could only be described as overwhelming. It was A4 size and an inch thick. Needless to say, in the time allowed for the review I have not managed to read it all.

Although good, the documentation is not aimed at beginners. It is assumed that if you are told something once it will be sufficient. Those who think the BBC User Guide is complex will probably be defeated by this one as well.

Having briefly described the system, who is it aimed at? Basically if you want to run new languages, develop dedicated systems or program in 6809 machine code it is a second processor you should consider carefully, as the alternatives are likely to cost you a lot more.

All in all this is a powerful second processor and one that I wish I could keep after this review.

**Mike Cook**

---

# Is it time to extend your BBC Basic?

**Addcomm** *Vine Micros*

AS the name suggests, the Addcomm ROM chip adds some new commands to the BBC Micro. I was astonished on first typing *HELP ADDCOMM to see more than two complete screenfuls of new commands and detailed syntax.

In all, 40 extra Basic-like commands are available for use in direct mode or, in most cases, within programs – even in multistatement lines.

The new commands may be divided into three main groups – Graphics (11 commands), Logo/turtle graphics (8 commands) and Utilities (21 commands).

A general impression of the extra functions available may be gleaned from Tables I, II and III.

The combination of a variety of basic toolkit type utilities on the same chip as extended graphics commands is very useful, especially if your sideways ROM slots are at a premium, such as if you do not have a ROM extension board fitted or are an avid chip collector!

The review version was 1.00 and the documentation provided was a pre-release of the inevitable "manual in preparation".

However even this pre-manual covered 15 sides of A4 and was quite adequate to explore the new commands.

Inevitably a few mistakes and some areas of insufficient clarity were present, though I'm sure these will be cleared up in the final manual.

Fitting the chip was straightforward – it simply plugs into a sideways ROM socket – though remember a 1.00 or greater operating system must be present to use it.

The Addcomm chip is fussy as to where it sits, a fact not mentioned in the supplied documentation.

In a disc-based system unless it occupied a slot between Basic and the DFS a number of commands were ignored. Moving the chip to the socket directly below (to the left of) Basic solved all the problems.

Addcomm seemed to be fully compatible with either the Acorn or Watford DFS (and according to the documentation, works with the Amcom DFS too).

Also, it did not present any incompatibility problems when used alongside 12 other popular sideways ROMs.

The addition of this chip does, however, reserve 256 bytes of workspace in user RAM and PAGE defaulted to &F00 (CFS) or &1A00 (DFS). This memory may be regained by switching off the chip (type Addcomm) and resetting PAGE or pressing Break – though this can be a nuisance after every use of Ctrl + Break (which switches Addcomm on again) and may lead to incompatibility with some software.

Surprise at the *HELP information had turned to amazement by the time I had typed in and run the short program (Program I) shown below.

The use of SCALE – in this case making the x and y axes range from 0 to 100 – made it very easy to understand, remember and use the drawing

```
 5 MODE 2
10 SCALE 0,100,0,100
20 CIRCLE 50,50,30
30 ELLIPSE 50,50,30,15
40 CFILL 1,3,3,1
50 FILL 50,50
```

*Program I*

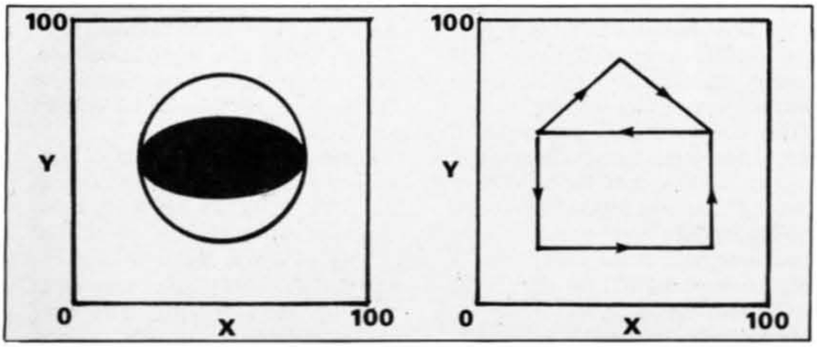

*Figure I*

commands.

For example, line 20 draws a CIRCLE of radius 30 units starting at the centre of the screen (x=50, y=50). This was much faster, especially in higher resolution modes, and much simpler to use than by employing trigonometrical functions such as SINes or COSines.

The ELLIPSE command (line 30) was similarly useful. In addition, the syntax of both these commands allowed continuous or dotted lines, empty or filled shapes, or portions of the perimeters (ARCS) to be drawn.

But why the surprise? The filled in part of the drawing (Figure I) was coloured orange – not one of the BBC colours normally provided. This was produced by a mixture of the logical colour red (1) and yellow (3) in the CFILL command.

You can therefore produce reasonable pinks, pale blues or on a black and white screen various types of shading. Furthermore, the FILL command acts like some of the extra PLOT functions (72-79, 88-85) available in Basic II, whereby extremely complex shapes may be filled in simply by giving the coordinates of any point within the object boundary.

With the addition of ready to use ROTATE and TRANSlocate commands BBC graphics become child's play.

The commands work like Basic and allow for the full passing of Basic variables – very useful in loops.

Implementation of the visual aspects of Logo provides eight commands which enable the user to move an invisible cursor around the screen drawing lines of specified length and direction.

The commands are designed to be used in conjunction with the extended graphics facilities of Addcomm (SCALE, ROTATE, TRANS) and allow you to simulate the step by step building up of drawings or geometrical figures.

On my first attempt I experienced some difficulty using these commands and moved off in unpredictable directions, but with a little practice and revision of my geometry I was soon able to move in the direction I wished.

It would have been much more helpful – and educational – if a visible arrow-like cursor was available by choice when trying out routines.

Program II illustrates some of the features of Addcomm Logo in action drawing a simple house-shaped figure.

A fair range of useful utilities are available in Addcomm to assist in Basic program development (Table III).

Many of these commands (MEM, FKEYS, FIND, KILLREM) can even be used within programs, though it may not always be advisable.

The commands I used most were those which gave information about the program – MEM, FKEYS, LVAR, and FIND.

MEM, as you might expect, indicates the amount of memory used by the program, the amount reserved for variables (after a program run), and the amount of free memory. Values are displayed in both decimal and hexadecimal.

This command is similar to the *FREE in Beebugsoft's Toolkit ROM but doesn't give details about PAGE, TOP, LOMEM and HIMEM.

→

### LOGO COMMANDS

| | |
|---|---|
| **PEN** | Defines type of plot, for example continuous or dotted. |
| **ADVANCE** | Draws line for specified distance. |
| **TURN** | Changes direction of Logo cursor. |
| **ANGLE** | Initialises direction of Logo cursor. |
| **LCIRCLE** | Draws circle with Logo cursor as centre. |
| **LELLIPSE** | Draws ellipse with Logo cursor as centre. |
| **LMOVE** | Moves Logo cursor to specified position. |
| **LPOS** | Returns position of cursor. |

*Table I*

### GRAPHICS COMMANDS

| | |
|---|---|
| **SCALE** | Sets own screen scale for graphic commands. |
| **UNSCALE** | Reverts to normal BBC screen coordinates. |
| **CIRCLE** | Draws circle of specified size and position. |
| **ELLIPSE** | Draws ellipse of specified size and position. |
| **ROTATE** | Rotates figure by specified angle. |
| **TRANS** | Translocate figure to new position. |
| **SMOVE** | As for Basic MOVE but uses set scale. |
| **SDRAW** | As for Basic DRAW but uses set scale. |
| **SPLOT** | As for Basic PLOT but uses set scale. |
| **FILL** | Fills in colour in desired position. |
| **CFILL** | Mixes required colour. |

*Table II*

```
  5 MODE 4
 10 SCALE 0,100,0,100
 20 ROTATE 0,0,0
 30 TRANS 0,0
 40 ANGLE 270
 50 LMOVE 20,60
 60 FOR sides = 1 TO 2
 70 ADVANCE 40
 80 TURN 90
 90 ADVANCE 60
100 TURN 90
110 NEXT sides
120 TURN 130
130 ADVANCE 39
140 TURN 280
150 ADVANCE 39
```

*Program II*

*From Page 121*

Ideally a combination of all the facilities of MEM and *FREE would be useful for those really greedy for maximum information.

FKEYS lists the details of any previously defined function keys and is similar to a command available on many other utility chips.

All variables used in a program, except the resident integer variables A%-Z%, or variables beginning with specific characters may be listed using LVAR. Unfortunately its usefulness is somewhat limited as the current values of the variables are not given.

Probably the most often needed aid when programming in Basic is one to remind you where things are located.

FIND enables the program developer to locate strings (individual characters or whole words), variable names or Basic keywords anywhere in a program or in a selected part of a program by highlighting their occurrences in colour.

Following this of course there are the facilities for replacing the found characters either globally or selectively with the GREPL or SREPL commands.

But beware! Injudicious global replacing of Basic keywords may lead to disaster!

The next two facilities are for saving memory by shortening the final debugged working program either whole or in part.

KILLREM simply removes REM statements whereas COMPACT goes even further and intelligently joins program lines together creating multistatement lines where possible.

This command does not, however, remove unnecessary spaces from within program lines as does the *PACK in Toolkit. If you have both the Addcomm and Toolkit chips in your machine at the same time you could really blitz a program by using KILLREM, COMPACT and *PACK in succession.

Incidentally, to improve subsequent readability of individual multistatement lines, lines can be split up again using Addcomm's LLIST option. This command may also be used within a program.

Two other useful commands are GOODPROG, which usually manages to fix a partly corrupted program, and VERIFY, which checks that the program saved to tape or disc is identical to the one currently in memory.

A number of other miscellaneous commands are also available on the chip. To aid graphics programming CHAR assists in the creation and editing of user defined characters and gives the codes required for VDU 23. This is much easier than having to work them out with pen and paper.

In addition, up to six separate windows may be set with SETWIN and selected with WIN. There is also a labelled GOTO facility – LGOTO – which jumps to a line containing a selected variable (lower case only).

I am not so sure this features adds much to structured programming as REPEAT . . . UNTIL and PROCs are usually sufficient.

Equally, I am also rather dubious about the use of the three commands POPFOR, POPGOS POPREP, which allow you to literally pop out of FOR . . . NEXT loops, nested GOSUBs or REPEAT . . . UNTIL loops rather than by exiting them properly. However it was interesting to be able to nest GOSUB 2000 times without getting an error message!

Finally, Addcomm has in store a Basic utility command which I haven't seen anywhere else for the BBC – SORT.

This command will sort the data within a single dimension string array into order very quickly. It was extremely useful, not least in teaching programs illustrating the use of arrays.

In addition to the 39 commands described so far OPT is available to modify highlighting, spacing, colour, etc, when using many of the other Addcomm commands.

Overall, the number of facilities offered on this chip seems to be good value for money. The extra graphics commands are especially worthwhile and at the same time the user is provided with a number of valuable Basic programming aids.

On the minus side however – an inevitable minus with a facility that tries to be a jack-of-all-trades – the lack of a visible cursor in Logo graphics and incomplete variable dump must be weighted against the most useful SORT command.

Installation of this chip alters PAGE by 256 bytes which may be a nuisance and, as the Addcomm commands are not tokenised as are Basic keywords, memory may be at a premium in long programs in the high resolution modes.

These are, however, only slight detractions from a very useful sideways ROM.

A major problem, as with all extra commands added in this way, will be transportability of programs to machines lacking this chip.

Addcomm, therefore, will have to suffice until BBC Basic eventually incorporates a similar set of commands.

In all, a noble attempt by the programmer, R.P.D. Mallett, which deserves success especially when you consider that he is only 17 years old!

**Mike Mahon**

### UTILITIES

| | |
|---|---|
| **ADDCOM** | Switches Addcomm off. |
| **MEM** | Details memory usage. |
| **FKEYS** | Displays contents of function keys. |
| **LVAR** | Displays program variables used. |
| **FIND** | Indicates occurrences of characters in program. |
| **GREPL** | Global replace. |
| **SREPL** | Selective replace. |
| **KILLREM** | Removes REM statements. |
| **COMPACT** | Shortens program, creates multistatement lines. |
| **LLIST** | Separates a multistatement line in listing. |
| **GOODPROG** | Cures a bad program. |
| **VERIFY** | Verifies a program from tape or disc. |
| **CHAR** | Defines and edit character. |
| **SETWIN** | Creates up to six screen windows. |
| **WIN** | Selects screen window. |
| **LGOTO** | Labelled GOTO. |
| **POPFOR** | Pop out of FOR loop. |
| **POPGOS** | Pop out of repeated GOSUBs. |
| **POPREP** | Pop out of REPEAT loops. |
| **SORT** | Sorts a single dimension string array. |
| **OPT** | Provides options within other commands. |

*Table III*

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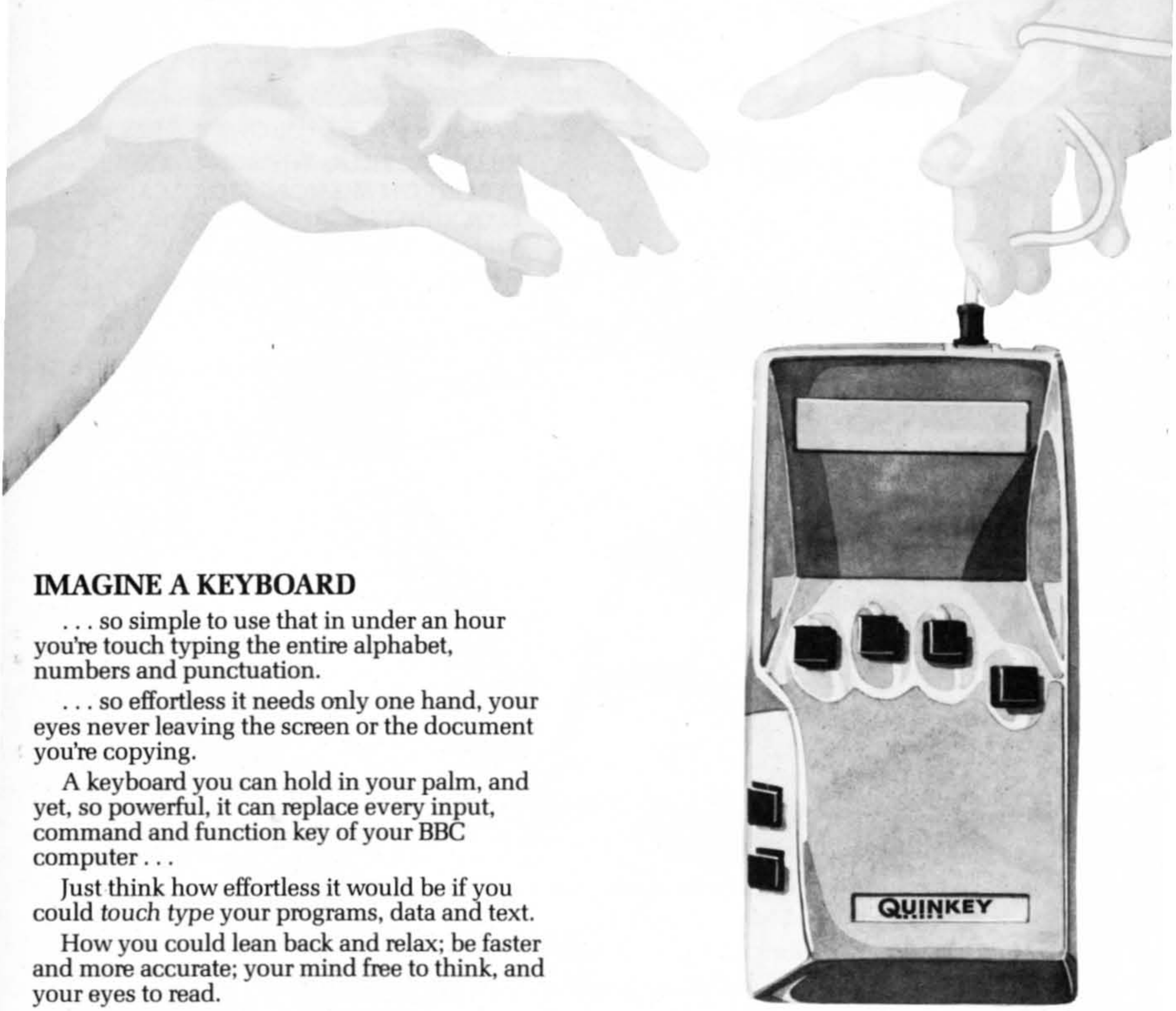

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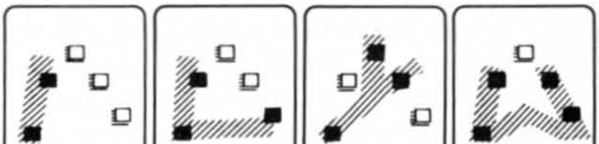

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|---|---|
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| BASIC I or BASIC II (unless using INKEY with negative argument) | Acorn |
| DFS 0.90 | Acorn |
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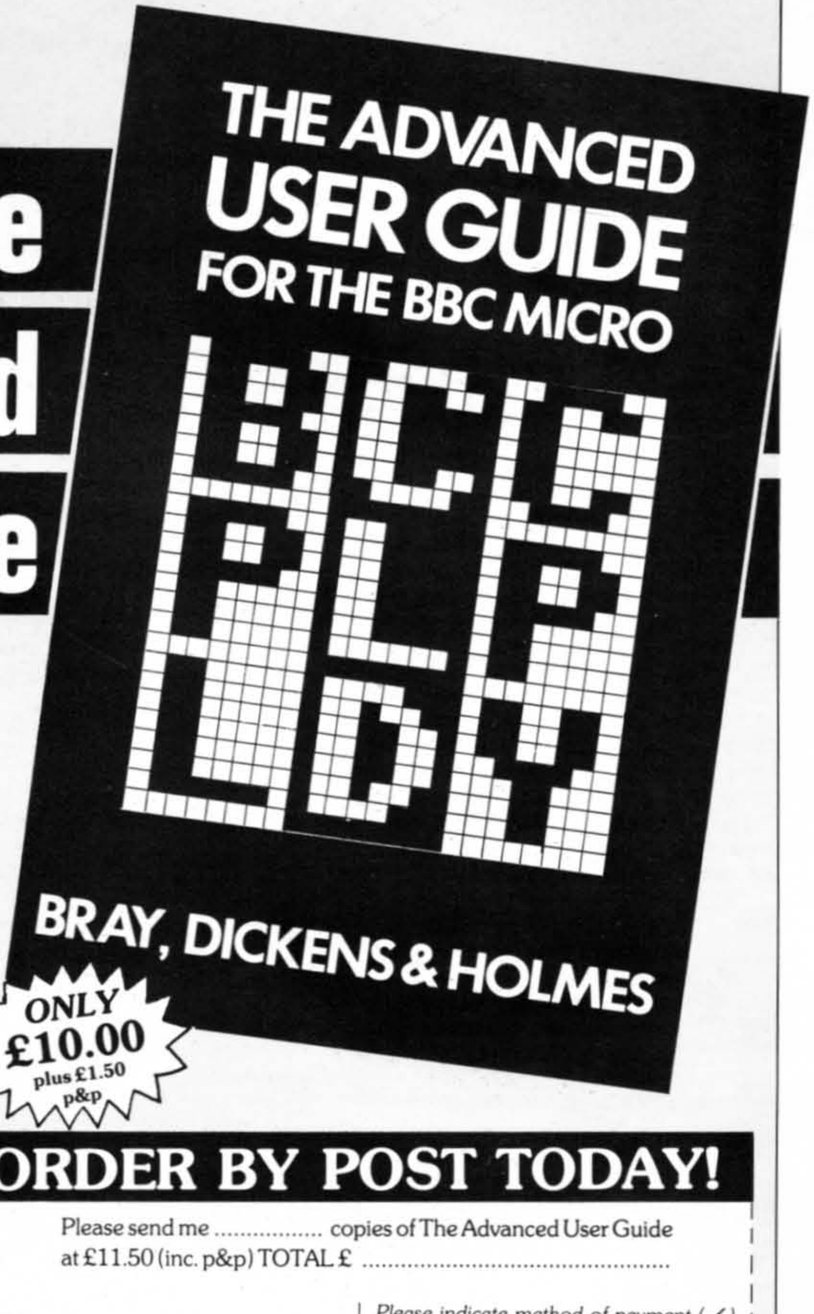

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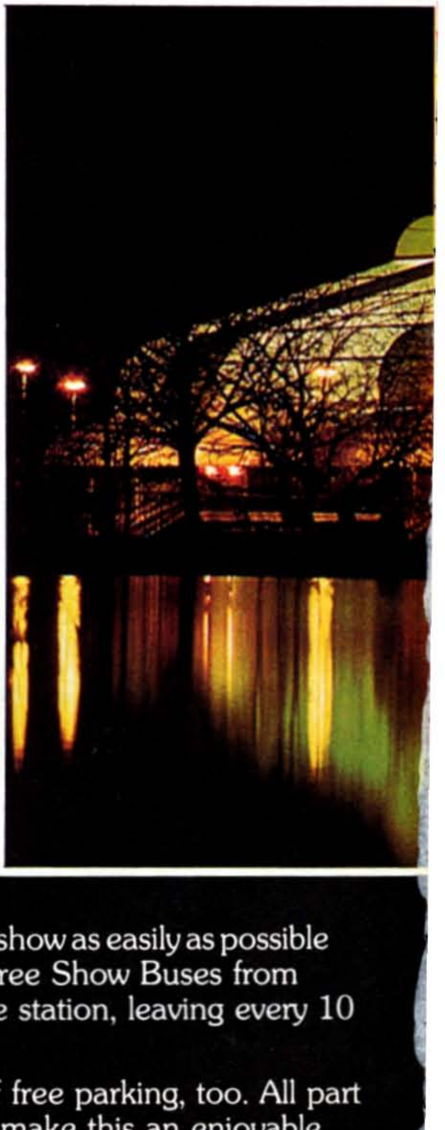

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# Level 9 Adventures are superbly designed and programmed, the contents first rate.

YOUR 64 June 84

Whichever machine you own, if you have the vaguest tendency towards adventure playing then you must try one of these games (unfortunately you'll probably end up wanting to buy the lot!).

**Computing Today, August 84**

To me, all Level 9 adventures create a remarkable atmosphere because the descriptions sound so life-like. This is where so many other adventures fail.

**Crash, July 84**

But it's not just the size of the game it's the quality as well that is astonishing ... ... scenes to fire the imagination.

**PCG, April 84**

As in all Level 9's adventures, the real pleasure comes not from scoring points but in exploring the world in which the game is set and learning about its denizens.

**Which Micro?, February 84**

argain of the year.
his
ur

**ptember 83**

I thoroghly recommend these Adventures, they are excellent value for money. No self-respecting Adventure-addict should be without them. I believe Level 9 are producing a series of Adventures which should be regarded as classics.

**Atari User, July 84**

These programs run very fast and there are no frustrating pauses. Level 9 Adventures are superbly designed and programmed, the contents first rate. The implementation of Colossal Adventure is nothing short of brilliance; rush out and buy it. While you're at it, buy their others too. Simply smashing!

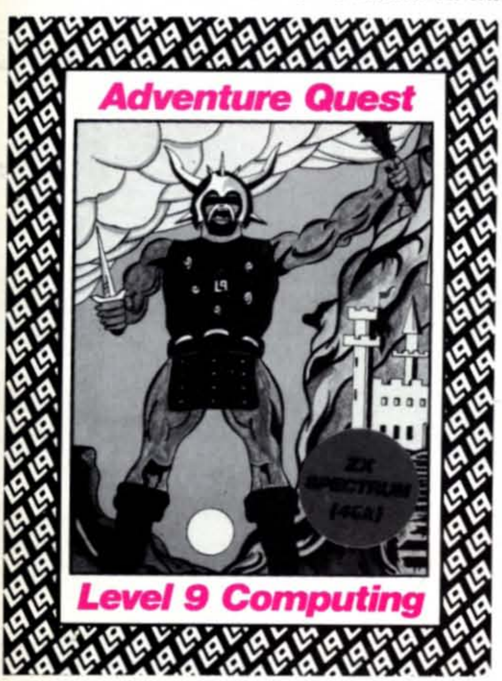
**Your 64, June 84**

Level 9 – arguably the producer of the best adventure games in the UK – has done it again. LORDS OF TIME is a sparkling addition to its stable of winners.

**Acorn User, July 84**

(SNOWBALL). This is another imaginative, massive-scaled immensely enjoyable adventure from those experts down at Level 9 Computing.

**Your Computer, March 84**



**Adventure Quest is the second in Level 9's acclaimed Middle Earth trilogy, though it can be played by itself.**

Available from W H Smith and good computer shops everywhere. If your local dealer doesn't stock Level 9 adventures yet, get him to contact us or: Centresoft, Microdealer UK, Ferranti & Craig, Leisuresoft, Lime Tree, LVL, PCS, R & R or Wonderbridge.

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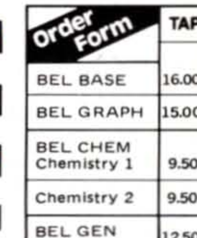

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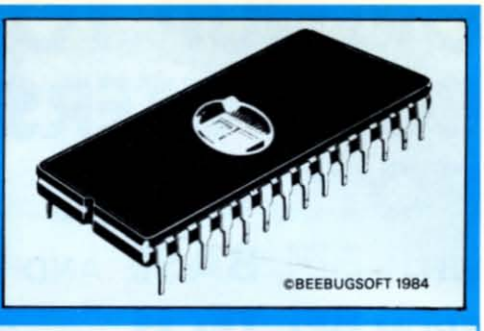

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| ***CHECK** | Verify a program or data in memory with disc/cassette. |
| ***CLEAR** | Clear all variables including integers. |
| ***EDIT** | Enter full screen editor. |
| ***FREE** | Display free memory and pseudo variables. |
| ***HELP INFO** | Display a screenful of useful system information. |
| ***MEMORY** | Display memory contents. |
| ***MERGE** | Merge a program in memory with one on disc/cassette. |
| ***MOVE** | Move program to run at specified address. |
| ***NEW** | As NEW, but can be issued from within a program. |
| ***OFF** | Cancel enhanced error handling. |
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| ***UTIL 2** | String search and replace. |
| ***UTIL 3** | Move Basic program lines. |
| ***UTIL 4** | List procedures and functions. |
| ***UTIL 5** | List values of A% to Z%. |
| ***UTIL 6** | List numeric variables. |
| ***UTIL 7** | List string variables. |
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Graphs, Pie Charts and Bar Charts are quickly produced on automatically drawn and scaled axes.

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Twenty user-defined characters and four large macro characters are supplied, and may be placed anywhere on the screen or redefined as required. Additionally a set of characters for circuit diagram generation is also included.

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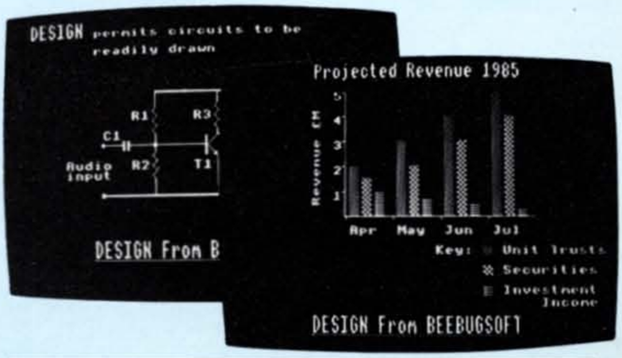
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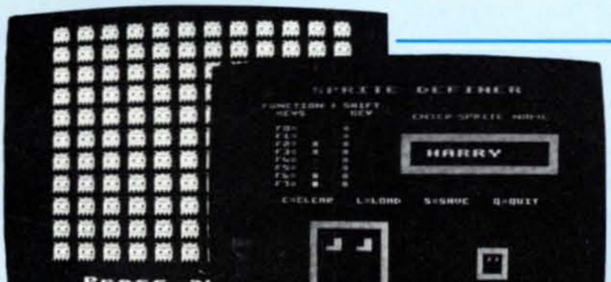
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Access

**Part II of PETER JOHNSON's examination of the extra instruction set available on the second processor**

# Simpler way to preserve the registers

**LAST month we looked at part of the enhanced instruction set to be found on the 65C02 – the chip at the heart of Acorn's 6502 second processor. This month we shall complete our survey.**

## Group 5

This group is small, containing just two instructions. These were also curious omissions from the original 6502 instruction set – the ability to increment and decrement the accumulator.

It is very difficult to use A as a counter on the standard processor, as the sequence to increment it is:

```
6502              6502
CLC       or      TAX
ADC#1             INX
                  TXA
```

Both sequences are three bytes long, and the second version has the undesirable side effect of altering X. Even the first version affects the carry flag, which may not be wanted.

Similar sequences are needed to decrement the accumulator. The INC A and DEC A (sometime written INA and DEA) instructions do the job in one byte, with the only side effects being the desirable changing of the sign and zero flags.

## Group 6

When a routine must preserve registers, a common way to do it is to put them on the stack. This is especially true in interrupt routines, which shouldn't alter fixed memory locations unless they are updating a specific item such as the system clock.

A common sequence in the MOS is:

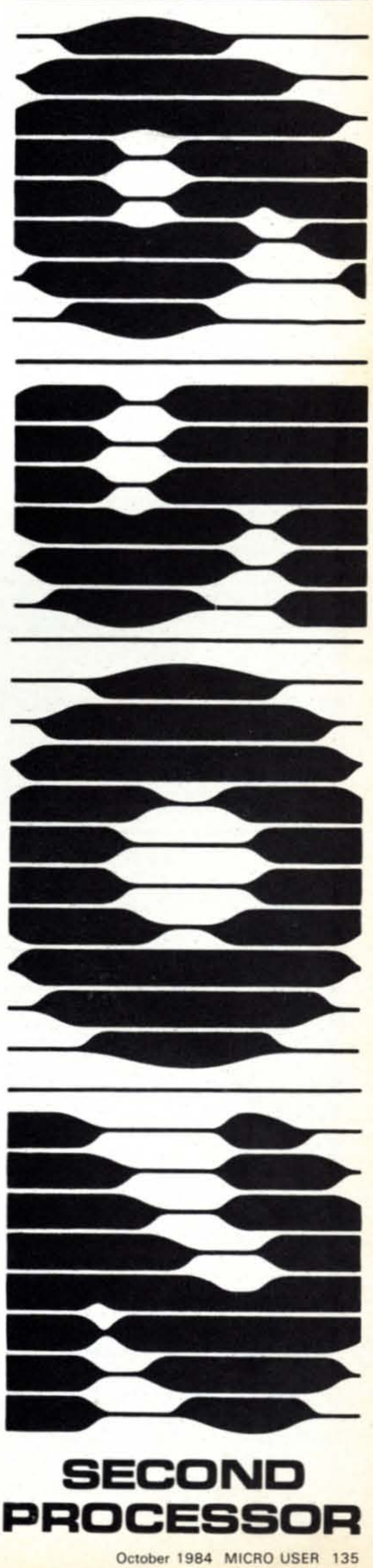
```
6502
PHA      Save A
TYA      Save Y
PHA
TXA      Save X
PHA
......
PLA      Restore X
TAX
PLA      Restore Y
TAY
PLA      Restore A
RTS
```

All of this just to preserve the registers! On the 65C02, this may be rewritten:

```
65C02
PHA
PHY
PHX
......
PLX
PLY
PLA
RTS
```

Not only is this much shorter, it is also easier to read (and therefore check). The PHX and PHY instructions push

→



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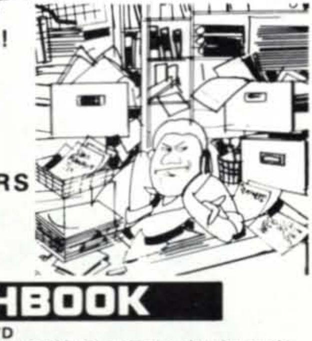

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*From Page 135*

the X and Y registers on the stack, and PLX and PLY pull them back again.

Note that it is now possible to swap the contents of any pair from A, X and Y without affecting the other register or fixed memory locations.

For example, to swap X and Y, the sequence:

```
6502/65C02
STX tmp1
STY tmp2
LDX tmp2
LDY tmp1
```

could be used. This takes four bytes and 14 cycles, as opposed to:

```
65C02
PHY
PHX
PLY
PLX
```

which takes eight bytes and 12 cycles if the temporaries are in zero page, or 12 bytes and 16 cycles if they aren't.

## Group 7

The only instruction in this group is JMP (abs,X). This is a totally new addressing mode added to an existing instruction.

To understand it, it is best to consider the normal 6502 instruction JMP (abs).

It takes a two byte address as the operand. At this address and the one after is the two byte address of the destination. For example, in the MOS, the OSWRCH routine contains the instruction:

```
6502
JMP (&20E)
```

This tells the computer to jump to the address held at &20E and &20F. The use of the indirect jump in this case is to enable the address of the final routine to be changed, by altering the contents of &20E and &20F.

This is essential for implementing filing systems on the BBC Micro, and provides the machine with an unequalled flexibility among low-priced machines.

Another use of JMP (abs) is to provide a jump table facility. This is roughly analogous to the ON ... GOTO statement in Basic.

| *Mnemonic* | *Operation* | *NVZC* | *Opcode* | *Bytes* | *Cycles* |
|---|---|---|---|---|---|
| **Group 5** | | | | | |
| INC A | A=A+1 | N.Z. | &1A | 1 | 2 |
| DEC A | A=A-1 | N.Z. | &3A | 1 | 2 |
| **Group 6** | | | | | |
| PHY | Stk=Y Sp=Sp-1 | .... | &5A | 1 | 3 |
| PHX | Stk=X Sp=Sp-1 | .... | &DA | 1 | 3 |
| PLY | Sp=Sp+1 Y=Stk | .... | &7A | 1 | 4 |
| PLX | Sp=Sp+1 X=Stk | .... | &FA | 1 | 4 |
| **Group 7** | | | | | |
| JMP (abs,X) | PC=M | .... | &7C | 3 | 6 |
| **Group 8** | | | | | |
| TSB zp | M=A OR M | N.Z. | &04 | 2 | 5 |
| TSB abs | M=A OR M | N.Z. | &0C | 3 | 6 |
| TRB zp | M=ˉA AND M | N.Z. | &14 | 2 | 5 |
| TRB abs | M=ˉA AND M | N.Z. | &1C | 3 | 6 |

*M is the memory location addressed by the operand*
*X and Y are the 65C02 registers*
*Sp is the 65C02 stack pointer*
*Stk is the address &100+Sp*
*ˉA means NOT A, ˉC means NOT (the carry flag)*
*NVZC means that flag is affected, . means it isn't*
*7 means N is set to bit 7 the operand*
*6 means V is set to bit 6 of the operand*

Consider a problem where it is necessary to jump to one of 10 routines depending on the contents of the accumulator. If it is zero, jump to the first routine. If it is one, jump to the second routine, and so on.

A common way of implementing this is:

```
6502
ASL A               Multiply A by 2
TAX                 Index jump table
                    with X
LDA table,X         Get low byte
                    of address
STA temp
LDA table+1,X Get high byte
STA temp+1
JMP (temp)          Jump to that
                    address
.table              First
EQUW lab1           address
EQUW lab2
......
EQUW lab10          Last address

.lab1 \Routine for A=0
.lab2 \Routine for A=1
......
.lab10 \Routine for A=9
```

Basically the code looks up an address from a table formed with the EQUWs, and jumps to that address. The accumulator has to be multiplied by two, as each entry in the table is two bytes long.

The rather complex code used above may be simplified by using the 65C02's JMP (abs,X) instruction. It is different from the JMP (abs) because instead of jumping to the address held at the address given by the operand JMP (abs,X) adds X to the operand first and jumps to the address held there.

The new version of the jump table routine is:

```
65C02
ASL A           Still need to double A
TAX
JMP (table,X)
.table          and so on,
EQUW lab1       as above
```

This cuts the jump code down from

***From Page 137***

17 to 5 bytes, and from 25 to 10 cycles. Considering that such a routine may be central to the operation of a language such as Basic or Forth, it can be seen that the new instruction can have a profound effect on the execution speed of programs.

The bug in the 6502's JMP (abs) instruction, whereby a jump indirected across a page boundary went to the wrong address, has been corrected.

## Group 8

The test and set bits and test and reset bits instructions are related to BIT, but are probably more useful. Both instruction types may be used with zero page and absolute addressing modes. Unfortunately there are no indexed TSB/TRB instructions.

The operation of TSB is as follows: OR the operand with the accumulator and store the result in the operand address. The Z and N flags are set to reflect the result of the OR but the accumulator is not affected.

Put another way, TSB sets the bits of operand which are set in the accumulator and leaves the other bits unaltered.

The two sequences below have similar effects:

| 6502 | 65C02 |
|---|---|
| LDA addr | LDA#&A5 |
| ORA#&A5 | TSB addr |
| STA addr | |

The flags and contents of *addr* are identical after both sequences, though the contents of the accumulator are different.

The TRB instruction has the opposite effect to TSB. The operand is ANDed with NOT (the accumulator), and the result stored back in the operand. Again, the flags are set with respect to the result and the accumulator is unaltered.

It can be seen that after a TRB the bits in the accumulator that are 1 are set to zero in operand, and the other bits are unaltered.

These two are equivalent:

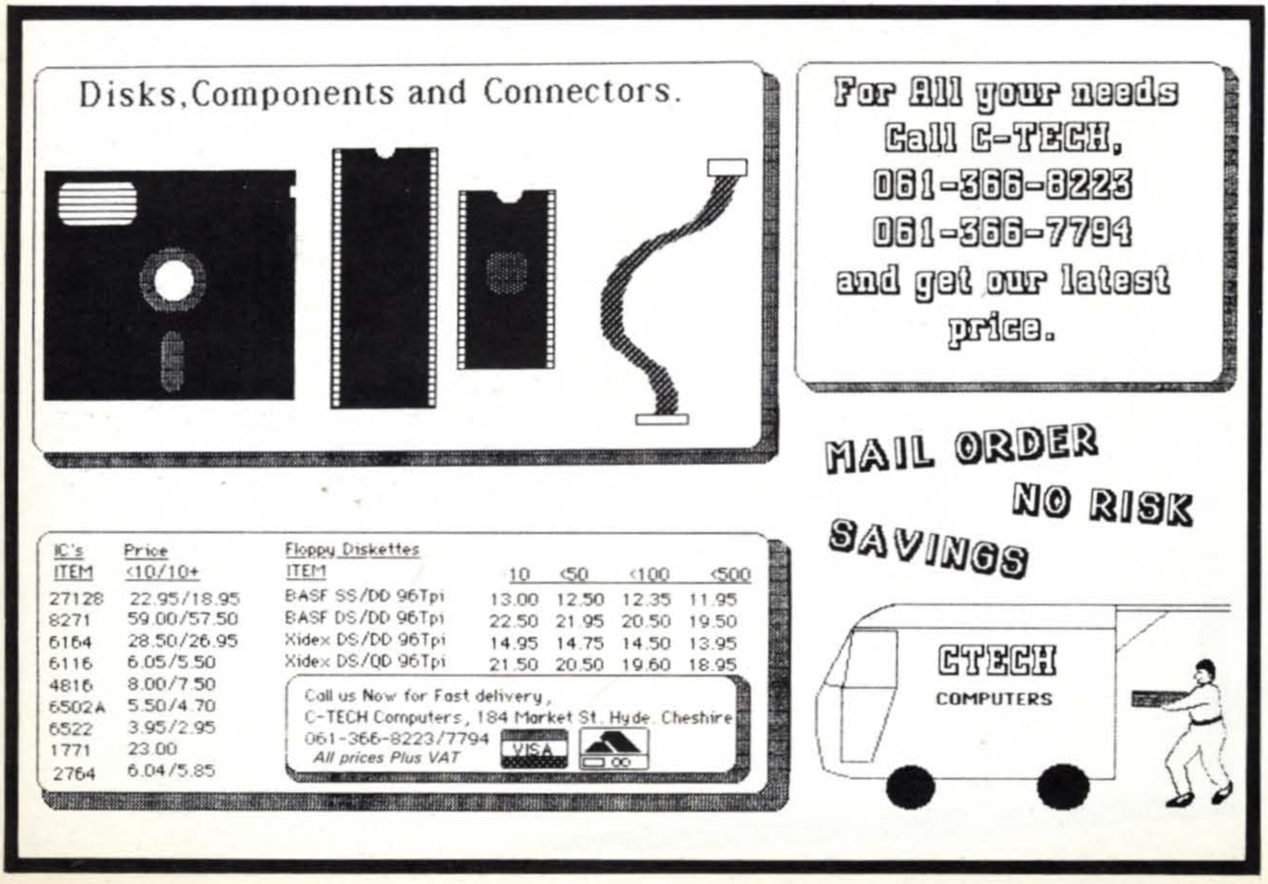
| 6502 | 65C02 |
|---|---|
| LDA mask | LDA mask |
| EOR#&FF | TRB addr |
| AND addr | |
| STA addr | |

For example, to set the bottom half of the operand byte to zero, the two sequences:

| 6502 | 65C02 |
|---|---|
| LDA addr | LDA#&0F |
| AND#&F0 | TRB addr |
| STA addr | |

would be used.

● *Next month we'll look at ways of implementing the enhanced features of the 65C02 using the HiBasic assembler.*



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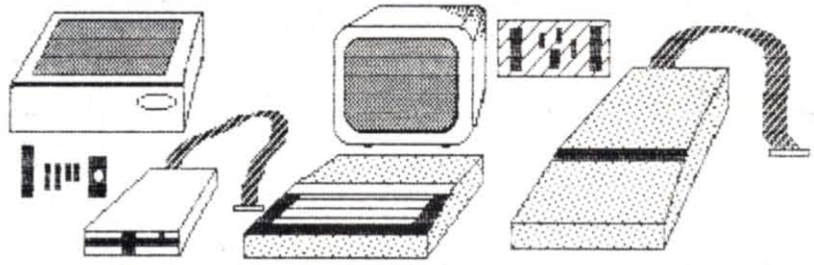

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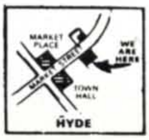

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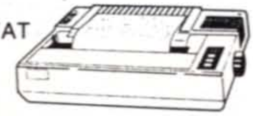

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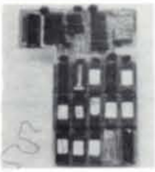

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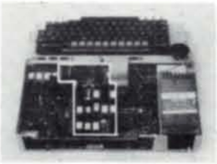

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The micro drive requires the standard Acorn disc interface, but a new disc filing system rom. Acorn DFS may be exchanged for the micro DFS for £12.00. The new micro disc filing system can read and write to Acorn DFS discs.

Thus if a 5¼ inch and a micro floppy were connected on the same cable files could be transferred between them.
**Capacity:** 80.64 K bytes **Transfer Rate:** 125k bit/s.

**BRANCHES**

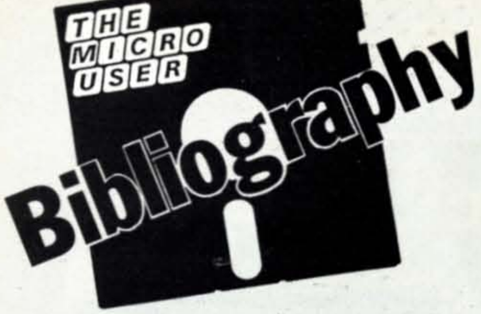
**FAREHAM: 59 WEST STREET (0329) 230670**
**KINGS LYNN: 17 TENNYSON AVE. (0553) 3782**
**MAIL ORDER: 36-38 WEST STREET**
**FAREHAM, HANTS. (0329) 230670**

ACORN COMPUTER

**Electronequip**

**36-38 West Street, Fareham, Hants (0329) 230670**

BBC



TIRED of spending hours searching your back issues for that article on interfacing? Sick of thumbing endless dog-eared pages for that hint on reprogramming the Break key. You know it's there somewhere – but where? Does tracking down a program remind you of an adventure game?

Isn't it about time you let your BBC Micro do the donkey work for you? Why waste precious programming time searching for an elusive reference?

*Now help is at hand – in the form of the Micro User Bibliography.*

This long-awaited database, developed for us by Jim McHugh, contains over 1,000 references from 18 editions of *The Micro User* (March 1983 to August 1984). It covers:

**games**
**educational utilities**
**reviews**
**peripherals**
**books**

and much much more. All the accumulated wit and wisdom of *The Micro User* is indexed to make life easier for you.

For instance, if you want to know where and when we talked about ENVELOPE just use the Micro User Bibliography. It will recall every occasion we wrote about this subject and tell you which pages to turn to.

The disc based utility contains an option to search for one or two strings and will complete the task in a maximum of 45 seconds. Alternatively you can view the whole Bibliography at your leisure. You can even generate hard copy if you need it.

So stop wasting your time searching and use *The Micro User* Bibliography to tap the full power of your back issues.

***Tap the power of The Micro User . . .***

***bring your back issues to life***

Please send me ________ copy/copies of The Micro User Bibliography
☐ I enclose cheque made payable to Database Publications Ltd. for £ ________

☐ BBC 40-track disc £7.95
☐ BBC 80-track disc £7.95
*Please tick box*

I wish to pay by
☐ Access ☐ Visa No. ________ Expiry date ________
Signed ________
Name ________
Address ________

Post to: Bibliography offer, Database Publications,
68 Chester Road, Hazel Grove, Stockport SK7 5NY.

---

★★★★★★★★★★★★★★★★★

# SOFTWARE ← RICKSOFT
# for the
# BBC MICRO

* Arcade Games * Adventures *
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**Essex RM12 4QX.**
**Tel: (04024) 47722**

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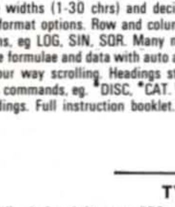
# CONTEX

*Professional Software for the BBC Computer*

### THE CONTEX SPREADSHEET



```
         Command (? for help)

              Jan      Feb      Mar
 1 Car tax   75.00     0.00     0.00
 2 Insure     0.00   150.00     0.00
 3 Loan     150.00   150.00   150.00
 4 Deprec.  100.00   100.00   100.00
 5 Repairs    0.00    25.00     0.00
 6 Maint.     0.00     0.00    56.00
 7 Petrol    36.00    25.00    52.00
 8 Oil        0.00     5.00     0.00
 9 Other     12.00     3.00     3.00
10
11 Total    373.00   458.00   361.00
12
13 Mileage  600.00   400.00   850.00
14 MPG       30.33    29.12    29.75
15 Cost/ml    0.62     1.14     0.42
```

The Contex Spreadsheet is one of the most versatile spreadsheet programs available for your BBC computer. It will process virtually any financial or statistical column/row analysis calculations you care to give it. Prepare your home and office budgets, process accounts, complicated invoices, job costing, small stock control operations, financial and statistical modelling, expense evaluations, foreign exchange etc.

Loaded into your 32K RAM means there is no ROM to install (which will save multiple machine installations a small fortune!). Hundreds now in use. Compare the spec. this revised, enhanced version gives you:

Over 1,000 cells in upto 26 columns by 99 rows. Formulae, data or text into any cell. Individually variable widths (1-30 chrs) and decimal places for each column. Nine digit accuracy. Various printer format options. Row and column insert or delete with auto formulae adjust. Use all BBC functions, eg LOG, SIN, SQR. Many new functions, eg. MAX, MIN, SUM, discount factor. Auto replicate formulae and data with auto adjust. Variables. Colour options. Save and restore to disc or tape. Four way scrolling. Headings stay on screen. Edit, search, help, model limits. Access to OS/DFS commands, eg. *DISC, *CAT. What-if modify command. Reference any cell by its id or by its headings. Full instruction booklet.

**Cassette £9.99**
**Disc £12.99**

### TYPING TUTOR

Specifically designed for your BBC micro to teach and encourage you to fast touch typing. Professionally enhance your keyboard skills with the 90 smoothly graded lessons and the free format option. Hundreds in daily use and recommended by adult educational authorities this program will monitor your progress, intelligently check each line for errors and time you against the clock in words per minute. Optional audio key feedback, metronomic pacing and revised performance targets. Auto keyboard/finder display for all lessons including those special ones you optionally add to the course.

**Cassette £9.99**
**Disc £11.99**

*Fast delivery. Discs supplied are 5¼" please specify if 40 or 80 track required.*

**CONTEX COMPUTING** (B10) .
**15 Woodlands Close, Cople, Bedford MK44 3UE.**

# TECHNOMATIC

## BBC Computer & Econet Referral Centre
## 01-208 1177

OCTOBER 84'

## ACORN COMPUTER SYSTEMS

| | |
|---|---|
| BBC Model B Special Offer | £320 (a) |
| BBC Model B + Starter Pack | £348 (a) |
| BBC Model B + DFS | £409 (a) |
| BBC Model B + Econet | £389 (a) |
| BBC Model B + Econet + DFS | £450 (a) |
| BBC Dust Cover | £4 (d) |
| Pair of Joysticks | £14.50 (d) |

## UPGRADE KITS

| | | | |
|---|---|---|---|
| A to B | £85 (d) | Installation | £20 |
| ACORN DFS Kit | £95 (d) | Installation | £15 |
| Econet Kit | £42 (d) | Installation | £25 |
| Speech Kit | £47 (d) | Installation | £15 |

## ECONET ACCESSORIES

| | | | |
|---|---|---|---|
| Terminator (Two reqd per installation) | £31 (c) | File Server Level II | £216 (c) |
| Clock with psu | £35 (c) | 10 Station Lead Set | £26 (c) |
| Printer Server Rom | £42 (c) | Extra Econet cable | £1.50/m (d) |
| File Server Level I | £86 (c) | Econet User Guide | £10 (d) |

## ACORN BITSTICK

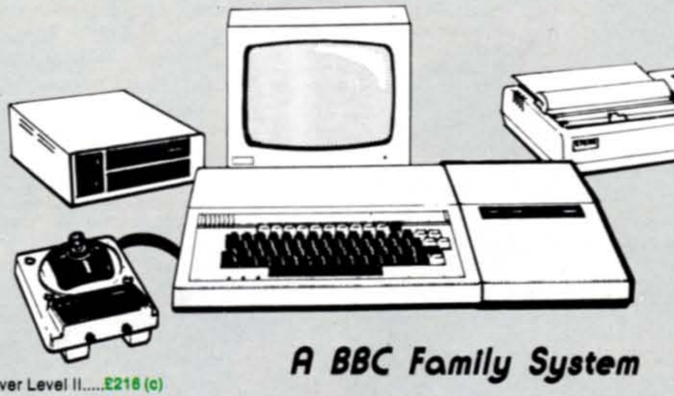
The Acorn adaptation of the renowned 'Bitstick' graphic CAD package — the "expensive joystick" that lets you exploit the powerful capability of the BBC micro to the full. The joystick is of a robust design which achieves remarkable precision without fiddliness. Total control is available from the joystick using the on-screen menu. It can draw freehand or follow lines of shapes chosen with high accuracy, and colours can be chosen from a palette displayed on the screen. Any part of a drawing can be magnified, by a virtually unlimited number of times, and upto 48 drawings can be saved on a single disc. The discs use a visual library system for easy identification. Inspite of its powerful features, the Bitstick is extremely friendly and easy to use, due to menus being displayed on the edge of the screens.
£328.00 (a) FX80 dump routine for the bitstick available.

## TORCH UNICORN PRODUCTS

The TORCH Unicorn system has been in the field for over two years and is now a proven Z80 system for the BBC. It gives you the potential to expand which no other system can currently offer. You can expand a single system with a 20Mb Hard Disc, have the processing power of a 32bit 68000 cpu with 256K ram and a UNIX operating system, or set up a network of upto 254 machines. All these capabilities are available NOW.

The TORCH UNICOMM Modem package is now available for the UNICORN range providing the benefits of the extensive TORCH communication packages. It offers three options: **Uniview** for viewdata services, **Uniterm** for terminal emulation, and **Unimail** which allows messages and files to be exchanged between Unimail/Torchmail/Torchmail-Plus users. Access to files can be controlled by heirarchial passwords which determine the extent of access.

| | |
|---|---|
| Z80 Card ZEP100 with PERFECT Software Packages + Z80 Basic | £275 (a) |
| Z80 Disc Pack ZDP240 with software as above | £675 (a) |
| 20Mb Hard Disc + 1 × 400K Floppy Drive | £1,950 (a) |
| UNICOMM Communications Package + modem | £161 (a) |
| Unicorn 68000, Unix OS/Z80B/256K, 20MB Hard Disc, 400K Floppy | £2995 (a) |



*A BBC Family System*

## ACORN Z80 2nd Processor

This processor converts your BBC into a complete business micro with all the computing power a professional would need. The system is CP/M based and is supplied with a very extensive software package. The package includes three office productivity programs, (memoplan, fileplan and graphplan), Systems generator program, three programming languages plus the ACCOUNTANT business program. Software is accompanied by extensive manuals that not only get you started but also answers your whys and hows.
All for only £299 (a)

## ACORN 6502 2nd Processor

This processor is designed for the serious computer user who wants to get even more out of his computer. This processor provides increased memory — allowing up to 44K for Basic programs and up to 60K for assembly language programs, regardless of screen mode in use. (ideal for VIEW). An increase in speed means that programs run up to 50% faster. The second processor/BBC combination offer computing power comparable to systems costing twice as much. £175 (a)

## TORCH GRADUATE SYSTEMS

This latest addition to the range of BBC upgrades will upgrade your BBC to a powerful 16bit business computer and make it disc & hardware compatible with the IBM PC. Its MS/DOS is customised to IBM compatibility allowing access to the massive range of IBM compatible software, programming aids, compilers and languages. It uses A8088 CPU at 5MHz, 128K or 256K ram, single or dual drive, software compatibility allows LOTUS 1-2-3, Flight Simulator and other popular IBM PC business programs to run. Connection of the Graduate is simple, with just a connection to the 1Mhz Bus. The disc drives can be used in both BBC and IBM PC mode without needing an Acorn Disc Interface in the computer. The top-of-the-market GRADUATE Model G800/2 will come complete with the superb Xchange suite of programs, comprising a full feature word processor, a financial planner, a database, and a business graphics package. Although these programs are in modular form, they can be linked together to form an integrated software system that allows you to switch instantly between various tasks and to exchange information between programs. G800/2 £945 (a) Full spec & prices on application.

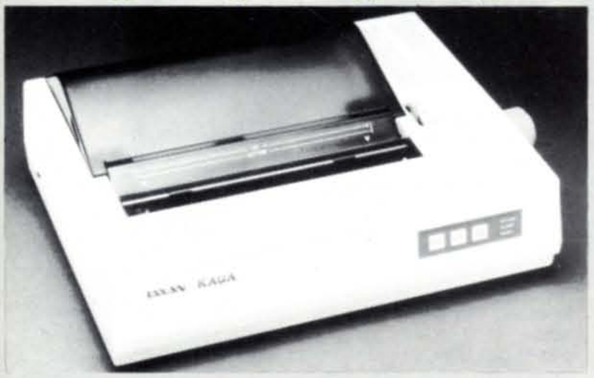
# PRINTERS

ALL PRINTERS HAVE A 12 MONTH GUARANTEE

## DOT MATRIX

This month we are adding the new **KAGA** printers to our range of quality dot matrix printers. These printers, with their **EPSON** compatible control codes are available in 80 col & extra wide 156 col versions. Features include NEAR LETTER QUALITY print using a 23 x 18 matrix, Dot addressable graphics in 8, 9 & 16 pin modes. Text modes include Normal, Italic, Enlarged, Condensed, Super & Sub script, Proportional spacing. Defined characters can be placed in ROM to give personalised print. An intergral 3K buffer, both friction & adjustable tractor feeds with built in paper roll holder, etc. etc. makes these superb 'value for money' printers unique.
KP810 (80 cols) £249 (a) KP910 (156 Cols) £375 (a) (With free BBC cable).

We continue to supply the ever popular, definitive **EPSON** range. This 'industry standard' range provide reliability and quality 'second to none'. The budget RX80FT Dot Matrix, has 100cps and all standard printing and graphic functions as well as friction and tractor feed. The deluxe FX80 has all the above, as well as a 160cps, buffer, programmable characters etc. For wider paper use — up to 16" — the RX/FX100 are ideal. RX80T £225 (a); RX80FT £240 (a); FX80 £318 (a); RX100 £345 (a); FX100 £450 (a).



## DAISY WHEEL

The Brother HR15 daisy wheel offers features normally found in printers costing far more. Features include: 14 cps, 3K buffer, proportional spacing, underlining, bold and shadow printing, two colour printing, super & subscript and many other features. Centronics parallel interface is fitted as standard.
BROTHER HR15 £349 (a) (With free BBC Cable).

The JUKI 6100 daisywheel with 20cps, 2K buffer, and switchable 10, 12, 15cpi + proportional printing. A linear motor ensures optimum reliability.
JUKI 6100 £345 (a)

## GRAPHICS PLOTTER/WORK STATION

Equally at home in the artists studio, hobbyists workshop, science lab or a classroom, this system has something to offer for everyone. The 3 colour graphics plotter provides both precision and versatility. The carriage can be moved with an accuracy of 0.025cm over an A4 area — the plotter being able to accept paper and far thicker materials at sizes of up to A3. The basic plotter carries 3 colour pens each of which is software selectable. Additional accessories greatly enhance the versatility of the unit without loosing the accuracy. The servo controlled drill/router, and scriber can be used on various materials. A unique Opto Sensor (using a Hewlett Packard device) turns the plotter into a high-res scanning digitiser to read & store whole diagrams and photographs.
Workstation Complete £490(a); Basic Plotter £270(a); Software on disc £3.00; Power Supply: PS12V £42; PS24V £78; Drill/Router Attachment £79; Scriber £7; Opto Sensor £72

# TECHNOMATIC

All prices exclude VAT

## PRINTER ACCESSORIES

**EPSON**
Paper Roll Holder £17 (d) FX80 Tractor Attachment £37 (c).
**Interfaces:** 8143 RS232 £35(c); 8148 RS232 + 2K £55(c); 8132 Apple II £60(c); 8165 IEEE + Cable **£65(c).**
Serial & Parallel Interfaces with larger buffers available.
Ribbons: RX/FX/MX80 £5.00(d); RX/FX/MX 100 £10(d); FX80 Dustcover

**KAGA TAXAN: RS 232 Interface + 2K buffer £85(c);** Ribbon KP810/910 £6(d)

**JUKI: RS232 Interface** £65(c); Spare Daisy Wheel £14(d); Ribbon £2.50(d) Sheet Feeder £199(a); Tractor Feed Attachment £99(a)

**BROTHER HR15: Sheet Feeder** £199(a); Ribbons Carbon or Nylon £3(d)

**BBC Printer Lead: Parallel (42")** £7(a); Serial £7(a)
Printer Leads can be supplied to any other length.

**Plain Fanfold Paper with extra fine perforation (Clean Edge):**
**2000 9.5" × 11"** £13(b); 200 15" × 11" £18.50(b)
**Labels: 2-3/4" × 1-7/16" in quantities of 1000**
**Single Row:** £5.25/1000 (d); Triple Row: £5.00/1000 (d)

## PRINTER SHARER BUFFER

A unique delux printer buffer/sharer providing a simple way to upgrade your computer system by allowing greater utilisation of existing equipment by reducing the waiting time for printing documents. Data from three computers can be loaded into the buffer which will continue accepting data until its 64K storage is full. The buffer will automatically switch from one computer to the next as soon as that computer has dumped all its data. The computer is then available for other uses. A LED bargraph indicates the memory usage, with LED indication showing from which computer the data is being fed from. There is simple push button control for PAUSE, RESET, and COPY facilities. The copy facility is ideal for continually printing copies of a document without 'tying up' the computer. Built in mains psu.
SP110 BUFFER/SHARER incl one cable set £275(b)

TECHNOMATIC

## PRINTER SHARER

Three Computers to one printer (parallel)........£65(b)
Six Computers to One Printer (parallel)......£129(b)
Cables for Three Way Sharer........................................................£25(c)
Cables for Six Way Sharer..............................................................£38(c)

## COMPUTER SHARER

Two Printers to one Computer....................................................£19(c)

## GRAFPAD

A low cost graphic tablet offering the performance & durability required by industrial and educational users. It is compact, accurate & reliable; working area 240 x 192mm + menu area. Comes complete with a CAD packag. £120 (b). 'Microdraw' CAD Package £21.70 (d).

## VIEW PRINTER DRIVER FOR FX80/KP810

This driver allows the use of all FX80s fonts to be used in text written using the VIEW rom. If user defined characters are held in the printer buffer they can also be used within the text. Manual includes examples. Supplied on 40 or 80 Track disc.................£7 (d).

## 01-208 1177

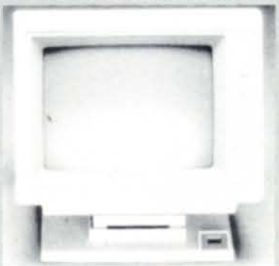
**Please add carriage: (a) £8; (b) £2.50; (c) £1.50; (d) £1.**

# MONITORS

A choice of high quality RGB and Monochrome monitors are available. The British made **MICROVITEC** Std/Med/Hi Resolution 14" monitors offer a consistent reliable performance. Their resolution ranges from 452 pixels horizontal on the std res monitor to 895 pixels on the Hi res monitor. Std res monitors are also available with RGB/PAL/Audio inputs. Dual input versions also available.

1431 Std. Res. RGB **£175** (a); 1431AP RGB/PAL/AUDIO **£225** (a);
1451 Med. Res. RGB **£295** (a); 1441 Hi-res RGB **£420** (a).
2031 20" Std. Res. RGB **£260** (a).
Plinth for Microvitec 14" Monitors **£8.50** (c).

The **KAGA** Vision 3 12" RGB monitor offers a superb performance but in a smaller cabinet with a genuine etched anti-glare screen. **£358** (d).
The Japanese made **SANYO** and the **KAGA** monochrome monitors provide an ideal answer for an 80 character hi-clarity display. A futuristic swivel base plinth with integral clock is available for the Kaga green monitor as an optional extra.

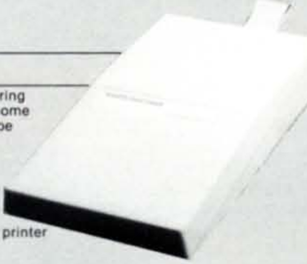

*KX1201G with stand*

SANYO DM 8112CX Hi Res Green Screen........................................**£99** (a)
KAGA KX1201G 20MHz Hi Res Green with etched screen....**£106** (a)
Swivel Base for Kaga Green (fitted with digital clock)...............**£22.50** (c)

**Note: All monitors are supplied with free BBC leads.**

BBC Leads: Kaga RGB **£5**; Microvitec **£3.50**; Monochrome **£3.50** (d)

## VIDEO DIGITISER



A high quality yet cost-effective unit offering uses for the scientific, educational and home user. Feeding in a video signal (this can be from a camera, VCR etc) will output to the BBC a high quality picture, with eight different grey levels. This picture can be stored on disc, manipulated or dumped to a printer. The friendly, yet sophisticated menu driven software comes complete with an Epson printer dump. **£250** (a).

## SANYO DR101 DATA RECORDER

A high quality tape recorder with circuitry specifically designed for data recording. Having normal as well as data recording, as well as cue/review and a tape counter, it makes this recorder an ideal choice for anyone wanting a reliable tape storage device. **£30** (c). Cassette **£3.00** (d).

## ACORN ANFO3 TAPE RECORDER

The official Acorn tape recorder recommended for the BBC. Has a counter, automatic record level, mains/battery and comes complete with a BBC cassette cable.......................................................................................**£28.50** (c).

## RH LIGHTPEN

A superior quality lightpen, features including: adjustable sensitivity, LED output to show data transmission, microswitch tip. Full software backup. **£39** (c). The 'Lightpen Colour Graphic Software' pack helps you to draw line drawings as well as more complex drawings. Colour fill, point plotting, line, square, triangle, circle XY rulers are all available with rubber banding facility. **£7** cassette, **£9** Disc. The 'Artfun' pack provides full interaction between pen and screen. Allows your initial design to be shrunk into a high res format, and these images can be stored for subsequent use. **£7** cassette. The 'Word Master' encourages the use of correct grammar and is an excellent aid. **£7** on cassette. The 'Ed Master' uses a quiz format, and up to 160 questions may be programmed by the teacher. **£7** on cassette (d).

# DISC DRIVES

Technomatic Disc Drives offer the best value for money. They come fitted with high quality slimline Japanese mechanisms & represent the state of art in disc drive technology. They are built to highest standards in design and production, and are all tested to their full performance capability before packaging. All drives are available with or without integral power supply. Dual Drives with PSU are supplied with generously rated integral switched mode power supplies. All 80 track TEAC drives are fitted with 40/80 Track switching at no extra charge to the user. Attractively designed steel casings are painted in hard wearing BBC matching beige paint. All drives can operate in single or double density modes. Drives are supplied complete with necessary cables, manual and formatting disc and are ready to be connected to the computer.

**Single Drives**
100K 40T SS TEAC **£100(a)**; TEC with psu **£135(a)**
200K 80T SS 40/80T TEAC **£155(a)** TEC with psu **£165(a)**
400K 80T DS 40/80T TEAC **£185(a)** Mitsubishi with psu **£195(a)**
3" 100K HITACHI Drive **£115(a)**
**Dual Drives**
2 × 100K 40T SS with psu: TEAC **£300(a)** TEC without psu **£225(a)**
2 × 200K 80T SS with psu 40/80T TEAC **£375(a)** TEC without psu **£275(a)**
2 × 400K 80T DS with psu 40/80T TEAC **£400(a)** Mitsubishi without psu **£325(a)**
2 × 400K 80T DS with psu Mitsubishi **£400(a)**.

Our 40/80 Track Switching Module will take care of your frustration of not being able to read or write 40 Track software on 80 Track drives. No additional cables or accessories needed. Full fitting instructions supplied. All for only **£30** (c).

The FLOPPICLENE disc head cleaning kit is the ideal way to ensure the optimum performance of your drives. The use of disposable cleaning discs eliminate the risk of recontamination and abrasion of the sensitive disc heads and ensure continuously reliable data capture and transmission.
Floppiclene with 20 disposable cleaning discs. **£14.50** (b)

OFFER

## SCOTCH 3M DISCS

OFFER

This month we are offering these high performance discs at a bumper bargain price — not to be repeated again. The current offer will be valid for orders received until 15th October only. These discs are manufactured with advanced manufacturing techniques that have enabled 3M to set the industry standard. Their quality is such that their error free performance is guaranteed for life.
Discs in pack of 10 (c): 40T SSDD **£12.50(c)**; 40T DSDD **£17(c)**; 80T SSDD **£21(c)**; 80T DSDD **£22(c)**

## DISC ACCESSORIES

Single Disc Cable **£6** (d) Dual Disc Cable **£8.50** (d)
10 Disc Library Case **£1.90** (d) 30 Disc Case **£8.00** (c)
Lockable Storage Boxes: 30/40 Discs **£14** (c) 70/80 Discs **£18** (c)

## KENDA DMFS

This is an alternative to the Acorn DFS with several significant advantages. *Single/Double Density *Up to 379 Files per disc. *No user ram required i.e. PAGE = &EOO *CP/M compatible file structure *Can read DFS files *Can read most Acorn and other protected software. Simple plug-in installation — comes complete with utilities disc and manual...................................................**£120** (c)

# MODEMS

We stock a modem for every requirement, whether it is for the business, or private user, whether you require access to a public database or a mainframe, whether for local or international use. We also carry suitable software — see our section on ROMS.

## TORCH UNICOMM

See our section on Torch for further details.

## ACORN PRESTEL

The dedicated Prestel adaptor complete with integral, BT approved, auto-dial modem and software in ROM £99(a).

## BUZZ BOX

A full spec, BT approved, pocket size, direct connect modem with both originate & answer modes, full & half duplex, allowing access to many databases, bulletin-boards as well as intercomputer communications. It conforms to CCITT V21 300/300 Baud standard. Battery/mains powered. £65(c) BBC Lead £3.50 External PSU £8.

## WS2000

A world standard direct connect modem switchable between 75,300/300,600,1200/75,75/1200 baud, awaiting BT approval. It is compatible with Bell 103/113/108, 202 and CCITT V21 & 23 standards and allows you to communicate with virtually any computer system in the world. This is one of the new generation modems, that will probably cover any communications standards you would ever need. This is the modem that will cover Prestel, Micronet, Telecom Gold, Distel, Microweb, One-to-One, Bulletin Boards both in the UK and abroad, etc. etc. as well as user-to-user communication. It also has a rather useful facility of 'Reverse-Prestel' mode i.e. 75/1200 so that you can communicate with other users who only have a standard 1200/75 type modem. What possibly gives this modem its biggest advantage is its option of computer controlled switching between all modes of operation. In addition, separate auto-answer and auto-dial cards are available, giving this modem possibly the greatest potential of all. Mains powered. £129(c).

POWER
TX DATA
RX DATA
CARRIER
ON LINE
VIEWTEXT
ON LINE
LOCAL TEST

Please phone/write for details of optional extras.

## TELEMOD-2

A BT approved modem complying with CCITT V23 1200/75 Duplex & 1200/1200 Half-Duplex standard, that allows communication with Viewdata services e.g. Prestel, Micronet etc., as well as using 1200 Baud for communicating with other computer users. Mains powered. TELEMOD 2 £65(b)           BBC Lead £3.50

## ACORN IEEE INTERFACE

This interface enables a BBC computer to control any scientific and technical equipment that conforms to the IEEE488 standard, at a lower price than other systems, but without sacrificing any aspect of the standard. The interface can link up to 14 separate IEEE compatible devices. Typical applications are in experimental work in academic and industrial laboratories, with the advantage of speed, accuracy and repeatability. The interface is mains powered and comes with cables, IEEEFS ROM, and user guide. £282(a)

## ACORN TELETEXT INTERFACE

This interface enables a BBC Computer to receive and store teletext information transmitted by both BBC and ITV. In addition it allows the downloading of transmitted software. The unit comes with a ROM and user guide. £195(b)

# EPROMER II

Our current version of the highly popular Eprom programmer is now being enhanced to provide more and better facilities for easy programming by the user. The software will maintain its superiority over all currently available similar programmers. The range of eproms handled has been widened to include the eproms with lower programming voltage and eproms which can be programmed using the fast algorithm. Control of all operations has been moved to the keyboard. The screen display has been improved to give more information. The screen editing facilities have also been modified to simplify the data entry.

**Preliminary Information**

- ★ The new Eprom Programmer will now program 2516, 2532, 2564, 2716, 2732, 2764, 27128 and 27256 + 5v eproms, and all but the 27256 in a single pass.
- ★ The programmer will be supplied with integral power supply, and interfaces with the BBC via the 1MHz bus. It is fully buffered and complies with Acorn protocols. There is no power drain from the computer.
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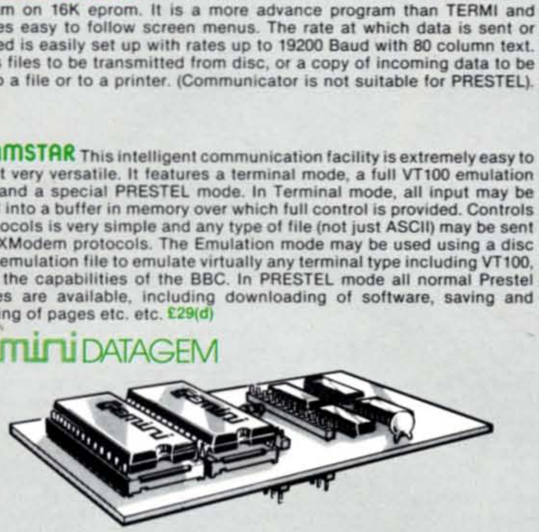

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THE BEEB BODY BUILDING COURSE

Part 19

# At last...the Beeb blows its own trumpet!

By MIKE COOK

MY wife appeared at the door to the computer room holding a glass of fizzing effervescent salts. "I could hear your stomach rumbling from downstairs", she said, proffering the liquid.

How could I tell her there was nothing wrong and the sounds were emanating from my latest hardware project? So I dutifully drank the liquid fizz and thanked her, and consequently spent longer than usual contemplating what I should write this month.

The topic I am exploring this month is the synthesis of audio waveforms. This enables the computer to sound like anything you care to mention. To accomplish this trick we need a little hardware and a lot of software.

While the BBC Micro has more types of interfaces than most computers, one it lacks is a D/A (digital to analogue) converter.

The analogue input socket (joystick socket) will feed into the computer a digital representation of any voltage applied to it. As the voltage can be a continuously varying (analogue) quantity, the converter must change it into a number of fixed precision.

We say that the voltage has been "quantised" or split into discrete steps or quanta. This type of circuit is known as an A/D (analogue to digital) converter.

With a D/A converter a number is converted into a voltage which varies in steps. If each step is very small then the output voltage appears to be continuously variable. In this way the computer can generate a signal which can be used to control or, as we shall see later, generate a musical tone.

*At this point I would like to say goodbye to all those readers who go and look at the games when they hit the first hard paragraph. It's been nice meeting you again and I'll see you next month.*

Now, for the rest of the foolhardy, let's look at how we can spirit an analogue voltage from a digital signal.

Remember that a number is represented inside a computer as a series of binary bits – that is, each bit can be on or off. In addition, when we interpret the number we give a weighting to each bit so that each successive bit has double the significance of the previous bit.

You can think of a bit as a switch being on or off. We can arrange these switches to feed current into a summing junction. If the amount of current each bit controls is proportional to its binary weighting then the current flowing into the junction will be proportional to the number producing it.

Phew! It's really much simpler than it sounds – have a look at Figure I.

Here there are three switches which can connect each resistor to a positive voltage or to earth. When a resistor is connected to the positive voltage current can flow into the junction. We say it is "sourcing current".

When it is switched to earth, current can flow out of the junction and it is said to be "sinking current". The amount of current each switch sources or sinks is controlled by the value of the series resistor.

The absolute value of each resistor does not matter – only its relative value. That is why they are labelled R, 2R, 4R. They could be 3k, 6k, 12k or any other values in the correct ratio.

Consider what happens when all the switches are connected to the reference voltage. Each will be sourcing current and the maximum amount of current will flow in the load resistor.

If you swap over S1, that amount of current is no longer being added to the junction but is being taken away from it.

→

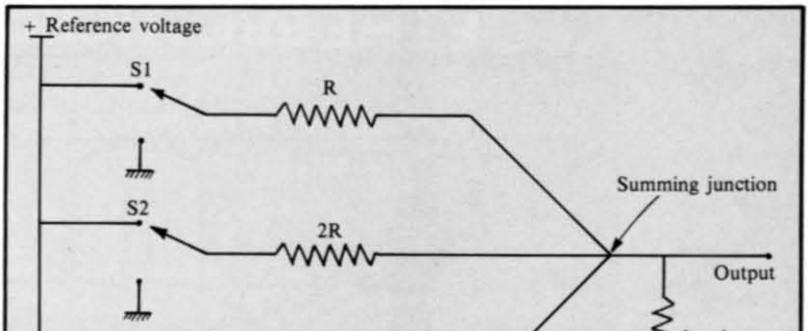

*Figure I: A weighted R D/A converter*

# THE BEEB BODY BUILDING COURSE

### *From Page 149*

Therefore the total current in the junction is halved.

However if instead of switching over S1 you switched S2, one quarter of the maximum current would be diverted and so the current would drop to three quarters. The final switch S3 makes an eighth contribution.

Now all we need to do is to make each switch be controlled by a single binary bit of the number we wish to convert and we have our D/A converter.

Normally we want to have a voltage ouput rather than a current output. This is easily achieved as the current flowing through the load resistor generates a voltage across it. This voltage therefore is proportional to our digital number.

This type of converter is known as a weighted resistor converter as each resistor has a value proportional to the binary weighting. If you like you can verify that this converter works by mathematically calculating the current flow for every combination of switch.

All you need to know is Ohm's law and how to calculate the value of parallel resistors – but I will leave this as an exercise for you. *(Translator's note – This phrase really reads: I am too lazy to do this and most of you will probably find it boring anyway.)*

In the above example we only had three switches (bits) and so the voltage we could produce could only be varied in eight separate steps (two to the power three).

There is nothing to stop us adding extra switches and doubling the series resistor for each. In this way we could construct an analogue to digital converter of whatever precision we chose. However the values of the resistors used would soon become very difficult to fabricate.

There is an alternative way of generating a D/A converter which only uses two values of resistor and is known as the R–2R resistor ladder. It is shown in Figure II.

It consists of a series of summing junctions called nodes. At each node the current is split in half so that the contribution of current from any one switch depends on how many nodes it has passed through to reach the output.

In this way as many switches as required can simply be tagged on to the end. When the circuit is drawn it looks like a ladder – hence its name.

The number of extra switches is limitless if all the resistors are of exactly the same value. However in practice a resistor can only be manufactured to a certain tolerance and it is this which actually limits the number of switches that can be added.

This is usually quoted as the linearity error of a D/A converter and is normally plus or minus half the least significant bit. This ensures that if the number increases by its smallest increment the analogue output will rise.

If this were not the case the linearity error would be greater than the least significant bit and monotonicity would be lost.

Monotonicity, by the way, is just a jargon word meaning that as you increase the number going in you increase – or keep the same – the voltage going out.

While we could construct a D/A converter from precision resistors and electronic switches there is little point as D/A converters are readily available at a reasonable price.

They come in a single package, which means all the resistors are physically close so that any change in temperature affects all of them equally. This is known as thermal tracking.

Obviously the more precise a D/A converter is, the more expensive it is. The one I have chosen to use with our project this month is an 8-bit converter made by Ferranti – the ZN428E–8. Figure III shows the internal configuration.

As it is 8 bits we will then have 256 separate steps in our output voltage – the same as specified by a single byte. It contains a latch to hold the digital input, but in our application this will not be needed as we are connecting it directly to the user port.

You will see that it also contains an internal reference voltage generator which is the maximum produced by the converter and can be fed from an external source if required.

The output of the D/A converter is zero volts to the reference voltage at an impedence of 4k. This needs to be fed into an amplifier to make it a little more robust.

As there are four amplifiers in the LM324 package it seems a waste to throw them away so I have configured them as a low pass filter. The whole

→

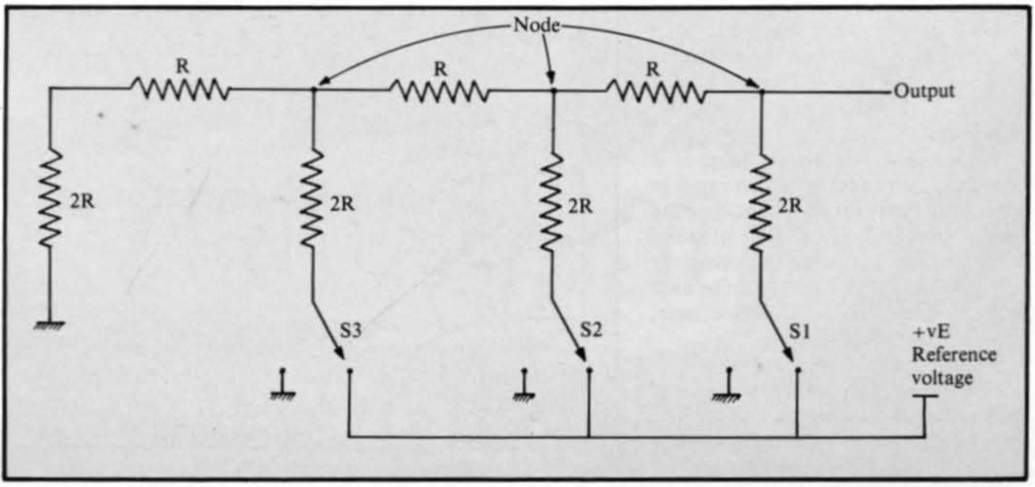

*Figure II: A R–2R ladder D/A converter*

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*From Page 150*

circuit diagram of this month's project is shown in Figure IV.

As you can see the lowpass filter makes up about half the complexity. The outputs from the user port are taken into the converter and the voltage emerges on pin 5.

This is then amplified so it is the maximum that can be supplied by this amplifier on a single 5 volt rail and then sent to a voltage follower buffer amplifier. The output from this is available for use and is also fed via a potentiometer to a 4th order Butterworth low pass filter.

Owing to lack of space I will duck out this month on a detailed explanation of how a filter works and how to calculate the component values. Suffice it to say that the circuit will let through low frequencies unchanged and will attenuate high frequencies. This particular design starts attenuating signals at 3KHz.

*See the panel on Page 154 for details on how to buy the kit. Note that, in response to many requests, you can also buy the printed circuit boards separately.*

Construction is, as ever, by slotting the components in and soldering up. You will also need a ribbon cable connector such as that in Body Build Pack No. 2.

Well, having built it how do we drive it? In this case it is very simple. Just set up the user port to be all outputs by:

**?&FE62=&FF**

and then any number poked to the user port will appear as an analogue output on the board. For example:

**?&FE60=128**

will set the output at the halfway mark.

Those working with the second processor attached to the BBC Micro will have to make the appropriate OSBYTE calls to achieve this.

In many cases the voltage output will need further amplification in order to drive the device you want to control. The exact circuit of this will depend on the power requirements of the device and it is difficult to give general guidelines.

So for the rest of this month's article we will look at another application of the D/A converter – that of a programmable waveform generator.

There are many applications where it is desirable to specify an exactly controlled waveform. One of the more interesting is the synthesis of sound.

While the whole topic can (and will) take several articles just to outline we can make a substantial start here. The only hardware required is what we have already. The magic in this case lies purely in the software.

If we wish to generate a specific waveform we only need to generate a series of numbers which describe the waveform and send them out in sequence to the D/A converter.

So we can make our computer generate any sound – from trumpets and organs to whales and diesel engines. The rub is that we need a description of it in the computer.

In practice, the technique for a periodic waveform is to calculate each point on the waveform and store it in memory as a look-up table. Then we can play it by outputting successive samples to the D/A converter.

The latter task takes up all the microprocessor's time so the waveform has to be precalculated.

The program in the listing allows you to generate any periodic audio waveform. If you connect the filtered output of the D/A converter board to an audio amplifier or the audio input pin on the 1MHz bus connector you will be able to hear the result.

The filtering is necessary because, as the waveform is made up of discreet steps, each step will generate a noise. This is known as sampling noise and is at the same frequency as the sampling rate.

As this is going to be many times higher than the fundamental frequency it can be filtered out to give a clean sound.

One of the reasons why musical instruments sound different is that they generate different types of waveform. With this program you can explore the relationship between waveform shape and sound.

It could even be developed into a fully-fledged music generation program, although this probably would require the use of several other techniques to be described in a later article.

When you run the program you will be asked how you want to specify the waveform. This can be done in two ways – by hand or mathematically.

If you choose to do it by hand you can use the cursor keys to trace one cycle of your waveform. This is handy for generating complex step sequences of any other shape you care to imagine.

If you choose the mathematical method you will be asked for an expression. This is not quite so daunting as it sounds.

All waveforms can be made up from a sum of SIN and COS waves. A pure tone can be represented by simply SIN(T) where T is the time or frequency.

If you want a quiet tone then 0.5*SIN(T) will give a tone of half the size. If you want the second harmonic – pure tone of twice the frequency – then SIN(T*2) will produce it. The fun comes when you start specifying sums of different amounts or different frequencies.

If you specify non-integer values you will, in effect, produce two or more notes played simultaneously. If these are carefully chosen you can generate chords. However this tends to introduce a discontinuity at the end of the waveform that can add extra harmonics to the sound.

In this way you can mimic the harmonic mix of any instrument. In fact the stops on an organ just add a certain amount of each harmonic to the sound in exactly the same way, so any texture of sound may be built up.

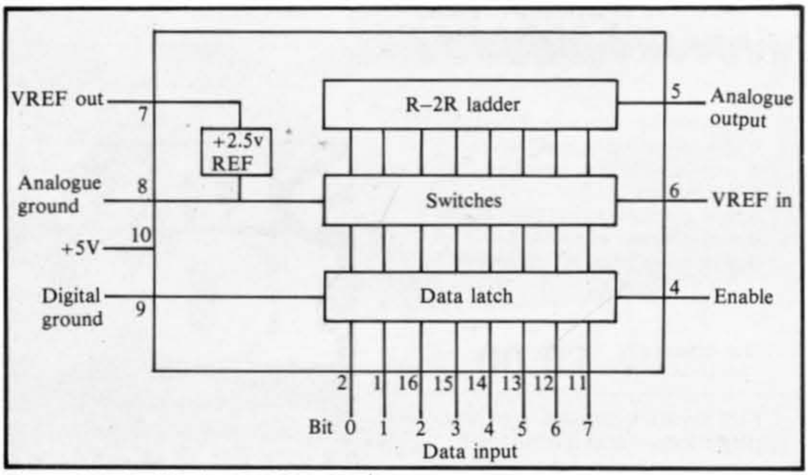

***Figure III: Inside the ZN428E–8 D/A converter***

You don't have to be content with simple sums of harmonics. You can try other functions as well, although any shape can eventually be built from a series of sums. Table I gives some of the functions you may care to try.

If you specify a COS function in place of a SIN the wave will be shifted by 180 degrees. It will produce a different looking waveform but will sound exactly the same. This is because the ear is not sensitive to the phase component of a waveform.

When you have specified the function it will be plotted on the screen. This is fascinating in itself and is very useful for getting the feel of mathematical functions.

If your chosen wave description goes off the screen it is automatically scaled and replotted. This is because there are only 256 steps in the D/A converter and if you cover the full range you get the maximum volume.

Remember if your function contains a syntax error the program will crash, so simply type RUN to set it off again. You can then play the waveform by pressing one of the number keys. Each key will produce a different note although not on a musical scale.

By pressing L you can alter the length of note that is produced – type in a number between 1 and 255. When you get tired of listening to the tone press D and you can define another waveform.

*Let's see how the program works.*

First of all the machine code that is going to produce the note is assembled. If you are working with the second processor you will have to arrange that this code is transferred and run in the I/O processor, as the appropriate OSBYTE calls to transfer the data to the D/A converter are not fast enough.

Then after the preamble you select the method of entering the waveform. If cursor keys are chosen, a procedure fills the waveform array *W(n)* with the tracing you make. Note that in this procedure the cursor keys are disabled from editing and enabled at the end. Therefore when you are debugging this program you will have to type in *FX4,0 to regain normal editing functions.

When the waveform reaches the end it is automatically redrawn and the next stage is entered.

If you take the mathematical approach your function will be plotted.

→

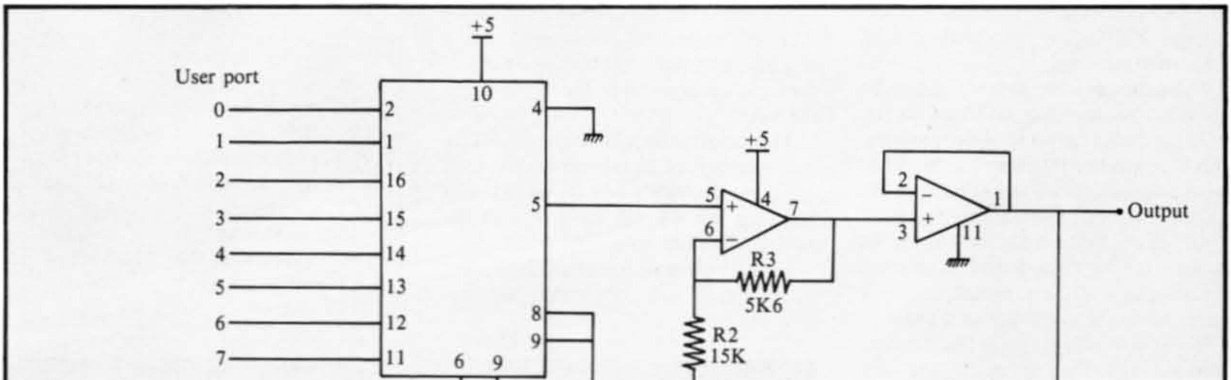

*Figure IV: The D/A converter with filtered output*

# THE BEEB BODY BUILDING COURSE

## *From Page 153*

If there are a lot of terms this might take some time. And do not worry if it disappears off the top of the screen for a time – you will see the whole waveform when it is scaled.

The next step is that the array *W(n)* containing the waveform is placed into memory starting at &A00. It makes the programming easier if the waveform table occupies a complete page of memory.

This can be changed to any page that is convenient for your set-up, but bear in mind you will have to change line 1440 to reflect the new address.

As *W(n)* contains the value of each point on the waveform in screen coordinates it is compressed in to byte-size chunks before storing in memory.

You can then play the notes. Each key pressed is converted into a value and passed to the machine code routine. This then produces the tone and perhaps requires a little more explanation than most sections.

Basically a new sample must be fetched from memory and sent to the D/A converter at fixed time intervals. This is controlled by timer 1 in the VIA. It is set up so that whenever it times out the program will fetch a new sample.

At each time-out the timer is automatically reloaded and started again so that, if the program does not "see" the time-out exactly as it happens and consequently gives the current sample longer than it should, the next sample gets slightly shorter. This sample jitter is so fine that no audible effect is perceived.

So timer 1 controls the rate at which samples are output. Timer 2 controls the length of the note. As we require note lengths longer than the maximum given by the timer we allow it to time out a certain number of times before ending the tone.

This value is passed to the machine code via the accumulator – *A%* in Basic – and is stored in memory at address &70. So that this value has fine control, timer 2 is not set to the maximum value in lines 1340 and 1540.

The process of generating the tone is very processor intensive and you cannot have the processor wandering off in the middle of this. To prevent this happening the interrupts are disabled on entry to this routine and enabled when it is completed.

With this you should be able to make all sorts of sounds. However as 256 samples have to be fetched for each cycle of the waveform it cannot generate very high pitch fundamental frequencies and the pitch of the note can only be specified in discreet steps.

These are fine for very low frequencies but for audio frequencies they tend to be a bit coarse. And with a real instrument the harmonic content of the note changes over the duration of the note.

This contributes a lot to the individual characteristic of an instrument's sound. All these problems can be solved with software but we will have to wait for next time to see how.

In the meantime have fun finding out what sounds you can make. See you next month.

**Functions to try**

| | |
|---|---|
| SIN(T) | A simple pure tone. |
| SIN(T)<br>+1/3*SIN(T*3)<br>+1/5*SIN(T*5)<br>+1/7*SIN(T*7) | First four terms of an approximation to a square wave. |
| SIN(T)*SIN(T*10) | Modulation function. |
| T | A saw-toothed waveform. |
| SIN(T*T) | A rising pitch over the duration of the waveform. |
| SIN(T+PI*SIN(T)) | Try it and see. |

*Table I*

***Component list for Body Build Pack 17:*** **IC1–ZN428E–8 D/A converter. IC2 – LM324 quad op-amp. C1 – 1uF Tant. C2 to C5 – 10nF polystyrene 5%. C6 – 0.1uF disc ceramic. R1 – 390R. R2 – 15K. R3 to R7 – 5K6. R8and R9 – 10K. R10 – 12K. R11 – 1K5. VR1 – 10K skeleton pot. 1 off 16 pin IC socket. 1 off 14 pin IC socket. 1 off 20 way IDC header plug. 1 off printed circuit board.**

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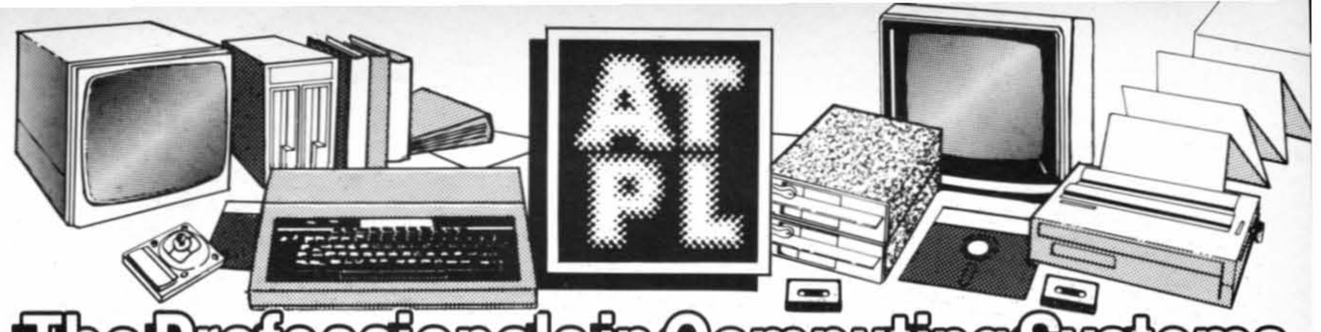
**The order form is on Page 158.**

## Audio Waveform Generator listing

```
   10 DIM W(255),CODE% &100
   20 PROC_INCODE
   30 MODE 1
   40 REPEAT
   50 PRINT
   60 PRINT"BEEB BODY BUILDING COURSE
"
   70 PRINT"OCTOBER 1984"
   80 PRINT"By Mike Cook"
   90 PRINT
  100 PRINT"Audio waveform generator"
  110 PRINT"Using the D/A converter"
  120 PRINT
  130 PRINT"Once you have defined a w
aveform"
  140 PRINT"You can play it by pressi
ng keys 1 - 9"
  150 PRINT
  160 PRINT"L - Will set the length o
f tone"
  170 PRINT"D - Allows you to define
the waveform"
  180 REPEAT
  190 PRINT
  200 PRINT"F - Formular definition"
  210 PRINT"C - Cursor keys definitio
n"
  220 A$=GET$
  230 UNTIL A$="F" OR A$="C"
  240 IF A$="F" THEN PROC_EVAL ELSE P
ROC_DRAW
  250 PROC_WTRANS
  260 PRINTTAB(33,1)"PLAY"
  270 L%=5
  280 REPEAT
  290 F=GET
  300 IF F>&2F AND F<&3A THEN PROC_PL
AY(F,L%)
```

→



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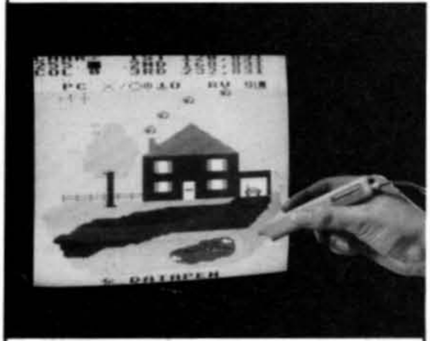
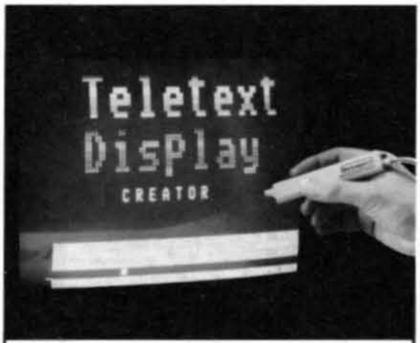
# Datapen BBC Lightpen Programs Datapen





**BEEBPEN DRAWING PROGRAM**
A comprehensive Mode 2 colour drawing program allowing plot commands, painting, circles, text, character defining, saving and loading to tape or disc, all to be selected and used with the lightpen.
**PRICE £11.95 Introductory Offer £9.95**

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Allows the busy programmer to quickly create Mode 7 colour graphics and test screens for combination into his or her own programs. Movable on screen menu allows use of complete screen for graphics. Full instructions and a discussion on teletext features are provided. **PRICE £9.95 Introductory Offer £7.95**

**BRITAIN**
The first in a series of educational Geography and Geology programs. Britain comes complete with three sets of tests, and these may be very easily changed by adding DATA statements in the Basic program. Full instructions and grid map supplied.
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- Good documentation
- User routines provided on tape and on printout

**SUPERIOR PERFORMANCE**

- Insensitive to ambient lighting
- Responds to different colours
- Program accessible LED lamp readout
- Switch for program control

The Datapen Lightpen itself comes complete with handbook, software on tape including two drawing programs and a printed listing showing useful routines.

## PRICE £25.00

Two drawing programs, SKETCH and SHAPE-CREATE are included with the lightpen and the programs shown above may be ordered additionally, or separately as required.

All prices above include VAT, postage and packing.

Please send your cheque/P.O. to:-

**Dept.MU2 Datapen Microtechnology Ltd.,**
**Kingsclere Road, Overton,**
**Hants. RG25 3JB**

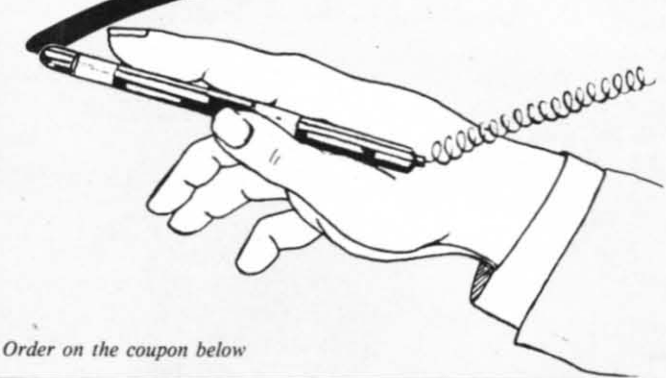
# THE BEEB BODY BUILDING COURSE

*From Page 154*

```
  310 IF F=ASC("L") THEN PRINT TAB(33
,4);"LENGTH":PRINT TAB(34,5);:INPUT,L
%
  320 PRINT TAB(33,4);SPC(6)
  330 PRINT TAB(34,5);SPC(5)
  340 UNTIL F=ASC("D")
  350 CLS
  360 UNTIL FALSE
  370 END
  380 DEF PROC_PLAY(P,DUR%)
  390 A%=DUR%
  400 IF P=&30 THEN P=&3A
  410 X%=P-&30+14
  420 Y%=0
  430 CALL PNOTE
  440 ENDPROC
  450 DEF PROC_EVAL
  460 PRINT
  470 PRINT"Input the waveform expres
sion"
  480 PRINT"In the form:-"
  490 PRINT
  500 PRINT"SIN(T)+0.3*SIN(T*3) .....
 Ect."
  510 PRINT
  520 INPUT W$
  530 PROC_AXIS
  540 MAX=0
  550 MIN=1024
  560 C%=0
  570 FOR T=0 TO PI*2 STEP PI*2/256
  580 B=511+511*(EVAL(W$))
  590 W(C%)=B
  600 PLOT 5,C%*4,B
  610 IF MAX<B THEN MAX=B
  620 IF MIN>B THEN MIN=B
  630 C%=C%+1
  640 NEXT
  650 IF MAX > 1023 OR MIN < 0 THEN P
ROC_SCALE
  660 ENDPROC
  670 DEF PROC_SCALE
  680 PROC_AXIS
  690 ADD=0-MIN
  700 SCALE=(MAX+ADD)/1024
  710 FOR A%=0 TO 255
  720 W(A%)=(W(A%)+ADD)/SCALE
  730 IF W(A%)=1024 THEN W(A%)=1023
  740 IF A%=0 THEN MOVE 0,W(A%) ELSE
PLOT 5,A%*4,W(A%)
  750 NEXT
  760 ENDPROC
  770 DEF PROC_AXIS
  780 CLS
  790 MOVE 1024,512
  800 PLOT 21,0,512
  810 ENDPROC
  820 DEF PROC_DRAW
  830 *FX4,1
  840 PRINT
  850 PRINT"Use the cursor keys to dr
aw the waveform"
  860 A%=GET
  870 PROC_AXIS
  880 X%=0
  890 Y%=520
  900 GCOL 3,3
  910 REPEAT
  920 REPEAT
  930 PLOT 69,X%,Y%
  940 A%=GET
  950 PLOT 69,X%,Y%
  960 IF A%=139 THEN Y%=Y%+4
  970 IF A%=138 THEN Y%=Y%-4
  980 IF A%=136 AND X%<>0 THEN MOVE X
%,0:PLOT 7,X%,508:MOVE X%,516:PLOT 7,
X%,1024:X%=X%-4
  990 IF Y% < 0 THEN Y%=0
 1000 IF Y% > 1023 THEN Y%=1023
 1010 UNTIL A%=137
 1020 W(X%/4)=Y%
 1030 PLOT 69,X%,Y%
 1040 X%=X%+4
 1050 UNTIL X%>1023
 1060 *FX4,0
 1070 PROC_DISP
 1080 ENDPROC
 1090 DEF PROC_DISP
 1100 GCOL 0,3
 1110 PROC_AXIS
 1120 MOVE 0,W(0)
 1130 FOR A%=1 TO 255
 1140 DRAW A%*4,W(A%)
 1150 NEXT
 1160 ENDPROC
 1170 DEF PROC_WTRANS
 1180 FOR A%=0 TO 255
 1190 A%?&A00=W(A%) DIV 4
 1200 NEXT
 1210 ENDPROC
 1220 DEF PROC_INCODE
 1230 FOR A%=0 TO 2 STEP 2
 1240 P%=CODE%
 1250 [
 1260 OPT A%
 1270 .PNOTE \ ACC A IS TIME X AND Y
IS THE TIME BETWEEN SAMPLES
 1280 SEI \ DISABLE INTERRUPTS FROM S
YSTEM
 1290 STA &70 \STORE NUMBER OF T2 TIM
EOUTS
 1300 LDA #&E0
 1310 STA &FE6E \ ENABLE THE TWO TIME
RS
 1320 LDA #&FF
 1330 STA &FE68
 1340 LDA #&40
 1350 STA &FE69 \ SET UP TIMER 2
 1360 STX &FE66 \LOW ORDER BYTE
 1370 STY &FE67 \HIGH ORDER BYTE
 1380 STX &FE64
 1390 STY &FE65 \START TIMER T1
 1400 LDX #0
 1410 .LOOP
 1420 LDA &FE6D \LOOK AT THE INTERRUP
T REG
 1430 BPL LOOP \BRANCH IF NO TIME OUT
 YET
 1440 LDA &A00,X \GET NEXT SAMPLE OF
THE WAVEFORM
 1450 STA &FE60 \OUTPUT IT TO THE D/A
 CONVERTER
 1460 INX
 1470 LDA &FE64 \RESET INTERRUPT FLAG
 WITH A READ
 1480 LDA &FE6D \LOOK AT THE INTERRUP
T REG
 1490 BPL LOOP \BRANCH IF T2 HAS NOT
TIME OUT
 1500 LDA #&7F
 1510 STA &FE6D \RESET ALL INTERRUPT
FLAGS
 1520 LDA #&FF
 1530 STA &FE68 \RE PRIME TIMER 2
 1540 LDA #&40
 1550 STA &FE69
 1560 DEC &70 \TAKE ONE OFF THE NUMBE
R OF T2 TIMEOUTS
 1570 BNE LOOP \ BACK IF WE HAVE NOT
FINISHED
 1580 LDA #&60
 1590 STA &FE6E \ DISABLE THE TWO TIM
ERS
 1600 LDA #123
 1610 STA &FE60
 1620 CLI \ ENABLE SYSTEM INTERRUPTS
 1630 RTS
 1640 ]
 1650 NEXT
 1660 ?&FE62=&FF : REM SET UP VIA AS
ALL OUTPUTS
 1670 ?&FE6B=&40 :REM SET UP TIMER MO
DES
 1680 ENDPROC
```

*This listing is included in this month's cassette tape offer. See order form on Page 217.*

# Make light work of it



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**USING a lightpen really DOES make light work of entering data into your BBC Micro.**

Painting on the screen or selecting options comes naturally with *The Micro User* lightpen.

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All in all, *The Micro User* lightpen is a really versatile add-on for your BBC Micro, with lots of possibilities.

We'll be publishing lots of interesting applications for the lightpen in forthcoming editions of *Micro User*. But if you simply can't wait, incorporating a lightpen in your own programs is simplicity itself.

And when you've done it, why not send us the results – you could become one of our authors!

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- **Packs 12 and 13:** *Components to control stepping motors in two different ways. Pack 12 uses the micro to control the stepping sequence. Pack 13 uses a dedicated chip.*
- **Pack 14:** *Turn your micro into a communications terminal by building an acoustically coupled modem. (Handset retainer not included.)*
- **Pack 15:** *Add the tremendous power of 4 extra User Ports to your BBC Micro.*
- **Pack 16:** *The ribbon cable and socket needed for pack 15.*
- **Pack 17:** *All you need to make a digital to analogue converter (programmable as a waveform synthesiser). You'll also need a ribbon cable (such as in pack 2).*

***Also available are a full-assembled light pen, sound-to-pattern converter, real time clock, pulse monitor and digital to analogue converter. For a small extra charge constructors who run into difficulty assembling pack 8 can send it in for testing. It will be returned fully operational.***

## YOUR ORDER FORM

**for the Beeb Body Building packs**

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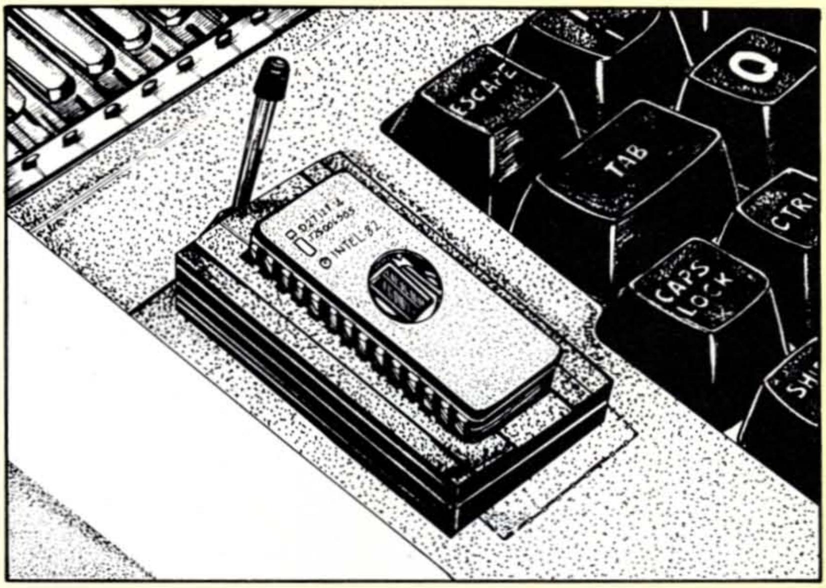


# Socket to your micro

**Unless you have a sideways ROM board, every time you want to change a ROM you have to delve inside your BBC Micro. Constantly replacing ROMs can also damage their delicate pins. MIKE SMITH gives a simple do-it-yourself answer to both problems.**

AS supplied, the BBC Micro can physically accommodate only three additional applications ROMs. If future ROM changes are contemplated, careful surgery has to be applied. Even so, this may put the hardware at risk.

So far the solution has been to add a sideways ROM board – complete with associated decoding – to allow expansion up to 16 ROMs. While it is certainly convenient to have the most frequently used ROMs permanently in place, for many applications selecting "ROM of the day" is just as convenient.

With this in mind, plus a few minutes browsing through a bits catalogue, the simple single ROM socket idea was born.

It was simply a matter of making one of the internal ROM sockets accessible on the front of the machine. That dotted box alongside the keyboard was just asking to be cut out anyway.

For the selected ROMs to survive repeated insertions, a zero insertion force (ZIF) socket is essential. This is a lever-operated device that closes onto the ROM pins after it has been dropped into place.

Mounting the socket into the machine is not unduly difficult, but does require the addition of a mounting arrangement to the keyboard panel.

Examination of the panel reveals little scope for drilling holes, and consequently any add-on hardware has to be mounted from the lower left corner.

The following constructional details supplement the diagrams of the completed assembly.

☐ Make the bracket and pillar as detailed in Figure I.

☐ Remove the four screws retaining the top cover of the ZIF socket, remove cover and operating level.

☐ Drill 10BA clearance holes through the depressions at each end of the socket.

☐ Remove the top cover of the micro. Using the top cover of the ZIF socket, mark the outline for cutting, as shown in Figure II. Cut away plastic until a clearance fit is obtained.

☐ Remove keyboard panel, taking care not to deform the connectors. Cut away about 1mm from the cross rib of plastic adjacent to the power supply, of width equal to the 28 way ribbon cable. A scalpel is all that is required on the soft plastic.

☐ Drill a 3.5mm hole in the keyboard panel. Dimensions are shown in Figure I.

☐ Fit bracket and pillar assembly to keyboard panel with 3mm screw and shakeproof washer. (The bracket should be given a slight downward bend to ensure that the leg bears on the panel.)

☐ Place keyboard and machine's cover into position (no need to fasten anything yet!). Place the ZIF socket on to the bracket through the aperture, and mark the fixing positions through the 10BA holes onto the bracket.

☐ Remove cover and bracket. Drill 10BA clearance holes at positions marked. Fasten ZIF socket to bracket with 10BA fastenings. Replace operating lever and top cover of ZIF socket.

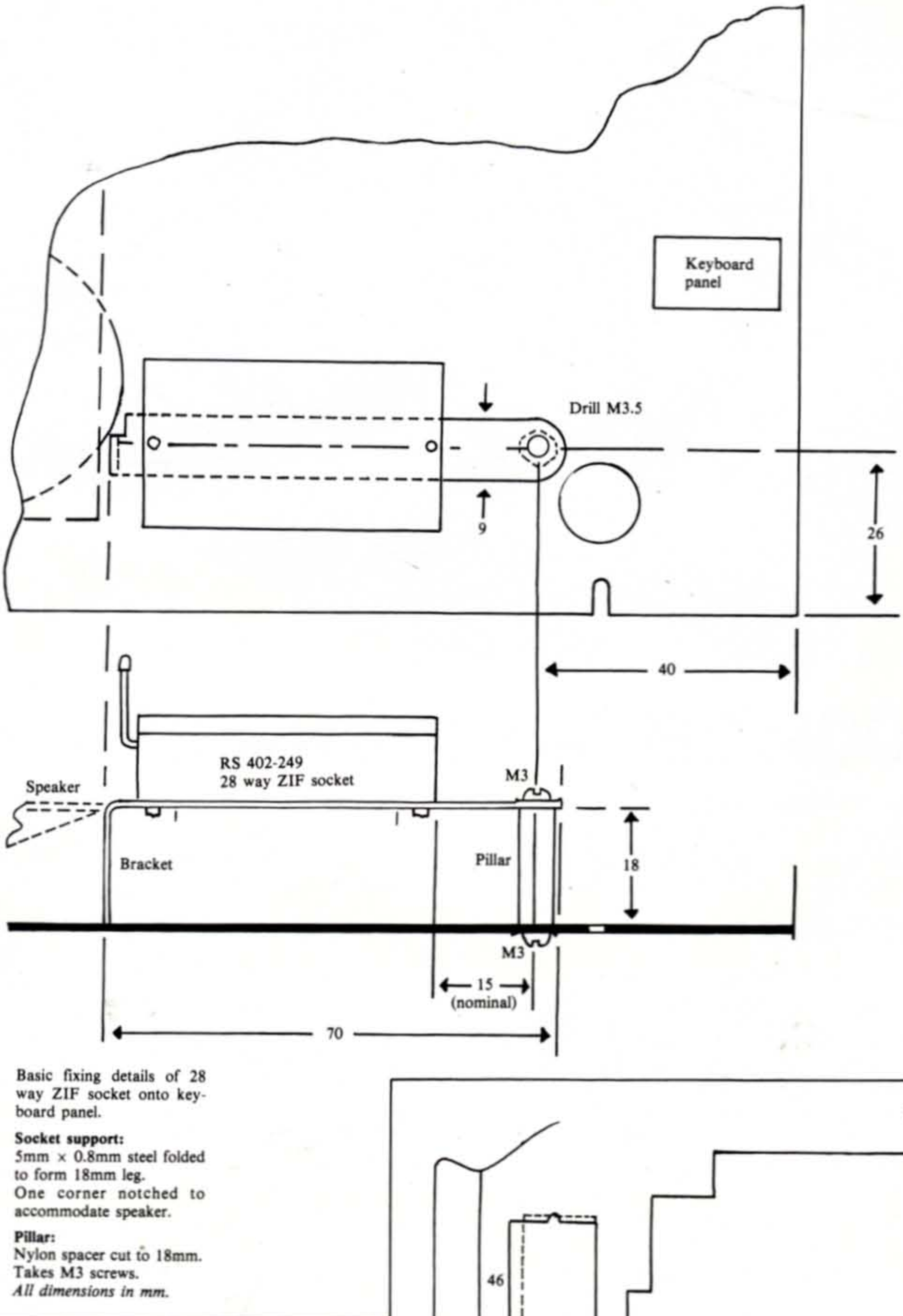
☐ The next stage is to connect the ZIF socket to the sideways ROM socket. Since I was unable to locate a 28 way insulation displacement connector plug, a 40 way plug was used, and carefully cut to 28 way after pressing onto the ribbon cable. Remember that the wire numbers out of the insulation displacement plug now alternate 28; 1; 27; 2; etc. The diagram shows the routing of the ribbon cable through the machine.

☐ The other end of the ribbon cable is now formed into place, cut to length, and connected pin-for-pin to the ZIF socket.

☐ Mount the socket and bracket onto the pillar, again using a shakeproof washer. Form the ribbon cable into the well at the left of the keyboard, and plug the IDC into a ROM socket.

☐ Fasten keyboard and cover into place, adjusting the bracket angle if necessary.

Well, that's it, constructionally speaking. The only things that require special attention are the assembling of the IDC plug on the ribbon cable, and ensuring that there is pin-to-pin connection accuracy with no loose


Keyboard panel
Drill M3.5
9
26
40
RS 402-249
28 way ZIF socket
M3
Speaker
Bracket
Pillar
18
M3
15
(nominal)
70

Basic fixing details of 28 way ZIF socket onto keyboard panel.

**Socket support:**
5mm × 0.8mm steel folded to form 18mm leg.
One corner notched to accommodate speaker.

**Pillar:**
Nylon spacer cut to 18mm.
Takes M3 screws.
*All dimensions in mm.*

***Figure I***

connections or shorts between adjacent pins.

It only remains to select ROM-of-the-day, plug in (the right way up, of course) and power up your new toy! Although I've not experienced any problems putting in a ROM with the machine switched on, it's not good practice and should be avoided.

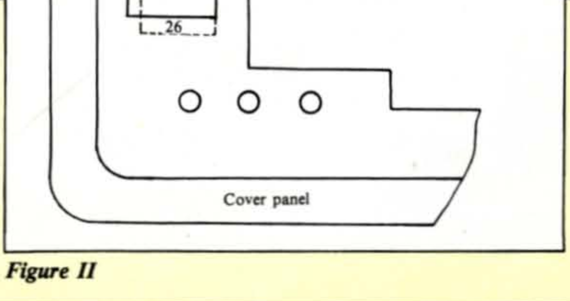
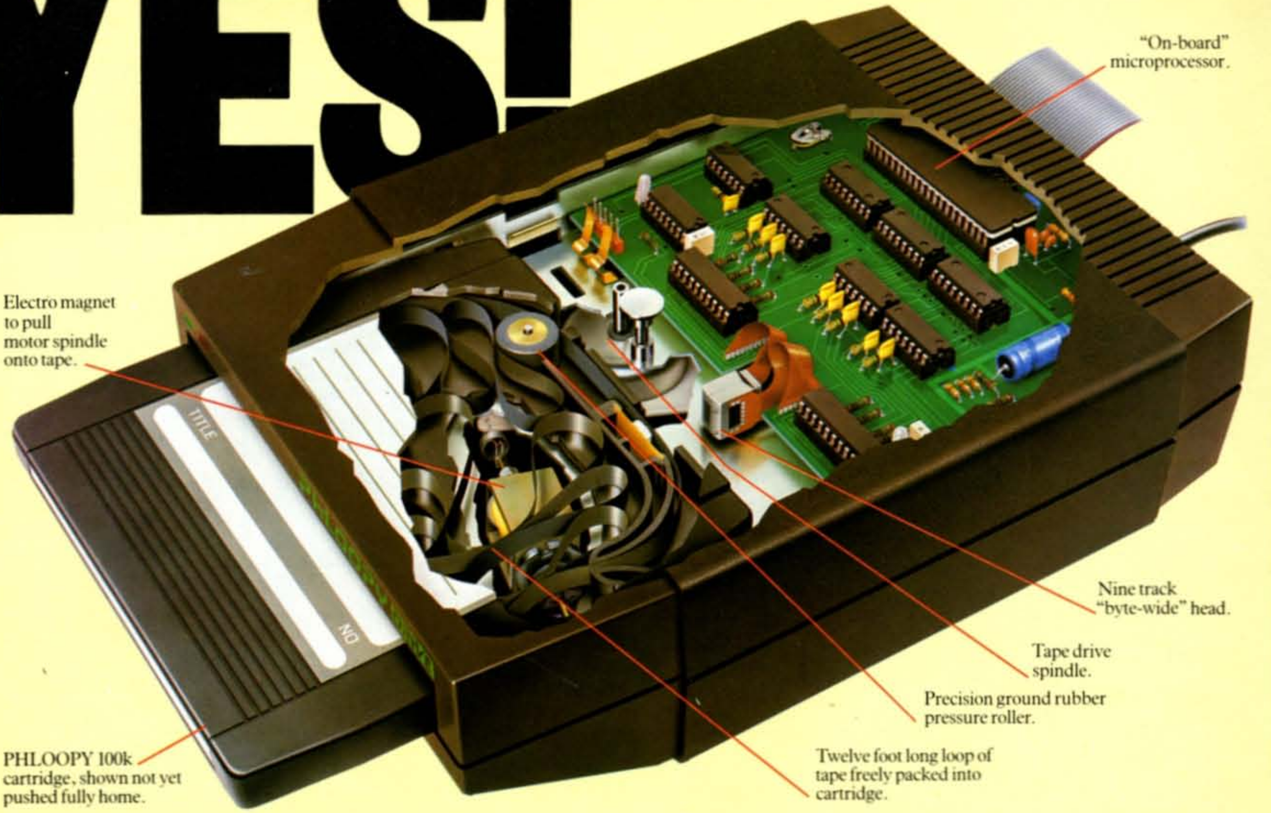

46
26
Cover panel

***Figure II***

# YES!


"On-board" microprocessor.
Electro magnet to pull motor spindle onto tape.
Nine track "byte-wide" head.
Tape drive spindle.
Precision ground rubber pressure roller.
Twelve foot long loop of tape freely packed into cartridge.
PHLOOPY 100k cartridge, shown not yet pushed fully home.
TITLE
NO

# A 100k BBC-drive for £99 + VAT

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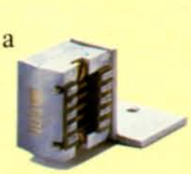

PHLOOPY does not record on a disk, but on a loop of quarter-inch tape contained in a rugged interchangeable cartridge.

The heart of PHLOOPY is a unique "byte-wide" magnetic head, that gives it its speed by recording nine tracks across the tape. Typically, you can access a file in only 3 or 4 seconds.

If you're used to waiting for a cassette tape to trundle programs into your BBC, you'll be amazed at PHLOOPY's performance – up to 100 times faster.

### Talking to your PHLOOPY

PHLOOPY's own software makes it respond to standard BBC filing system and Basic commands. Programs written to run on disk or cassette should run on PHLOOPY without problem. And because your PHLOOPY drive contains its own microprocessor – a second computer which does most of the hard work – it puts very little load on the BBC. The on-board computer also checks and automatically corrects any read errors.

### Your PHLOOPY Library

PHLOOPY cartridges hold a full 100k of data. You can buy blank cartridges for £3.75 each plus VAT. Many BBC programs will be available on PHLOOPY.

**Phi Mag Systems Ltd.** PO Box 21,
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**Order Form**

- Please send me further details about the PHLOOPY 100k data storage system for the BBC Model B.
- Please send me______(qty) PHLOOPY starter pack(s) for my BBC Model B microcomputer, including PHLOOPY drive, BBC interface, leads, connections, operating system in firmware, manual, and two PHLOOPY 100k cartridges, at £147.75 each including VAT, postage and packing. Amount £______
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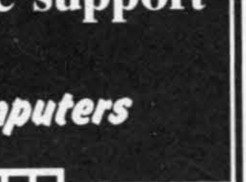

**Bolt on expansion module**
**£14.99** + £2 p&p

**Matching Printer Stand, can double for VDU Stand over the micro – only £14.99** + £2 carriage

## ELECTRON CONSOLE

The console will house the ELECTRON and will safely support the expansion interfaces which will plug into the rear of the micro and will support the VDU at eye level. Tidies up all wiring between the micro, cassette and VDU. The console stores the cassette and tapes and will allow space for drives at a later date.

**Electron console as shown**
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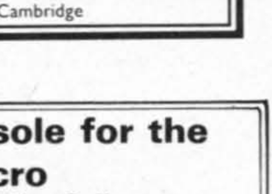

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**At the *Micro User* we're very impressed with this matched pair, and we're sure you will be too.**

**FREE!**
8 weeks' introductory membership of Prestel/Micronet will be given to all readers whose orders are postmarked before October 1, 1984.

Please send me ______ Communications packs at the total price of £139.95 each (includes VAT, post and packing).

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☐ I wish to pay by ☐ Access ☐ Visa

No. ______________________ expiry date ________

Signed ______________________

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# Write directly to integer variables – it's a lot quicker than plinging!

**By MARCUS ADAMS**

**THE following short program came about while writing a small machine code game for my children.**

Being something of a novice I didn't know how to output decimal numbers from the machine code so I decided to let Basic do it.

Using ? and ! was inexorably slow, so I decided to write directly to the integer variables and print them out instead.

Fine, but where are they stored? After much delving into back issues of *The Micro User*, I eventually came up with the following program:

```
10 base=&400
20 FOR integer=0 TO 26
30 PRINT ~(base+integer*4);" ";
40 PRINT CHR$ (64+integer);
   CHR$ (37);" ";
50 PRINT ~!(base+integer*4)
60 NEXT
```

*This is the program structure:*

**10** Integer variables are stored from &400-&472 so set *base* to &400.

**20** There are 27 integer variables *A%-Z%* + *@%*, so the FOR ... NEXT loop gives an offset from 0 to 26.

**30** Each variable is stored as four bytes in memory, hence their location is given by *base* + *integer *4*.

**40** *CHR$(64)* + *integer* gives the Ascii character corresponding to the variable's name, for example CHR$(64) + 2 = "B" and CHR$(37) is a %

**50** Uses the indirection operator to PEEK the value of the variable. Default output of the routine is in hex but this can be changed by removing the '~'.

The program has been expanded here for clarity, but can just as easily be put onto one line or in a function key.

Also, by replacing line 50 with:

```
!(base+integer*4)=0
```

all of the resident integers can be set to zero or any other number you choose.

What the competition hasn't been waiting for.

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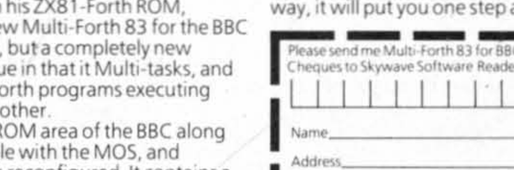

Here's the Forth Eprom for the BBC Micro that makes all others out of date.

It's Multi-Forth 83 from David Husband who has built his reputation for Quality Forth products with his ZX81-Forth ROM, Spectrum Forth-I/O Cartridge and now New Multi-Forth 83 for the BBC Micro. This is not rehashed Forth 79 Code, but a completely new version of the Forth 83 Standard. It's unique in that it Multi-tasks, and therefore the user can have a number of Forth programs executing simultaneously and transparently of each other.

Multi-Forth 83 sits in the sideways ROM area of the BBC along with any other ROMs in use. It is compatible with the MOS, and specially vectored to enable a system to be reconfigured. It contains a Standard 6502 Assembler, a Standard Screen Editor, and a Unique Stack Display Utility.

With this Forth, David Husband has provided the BBC Micro with capabilities never before realised. And being 16K rather than 8K is twice the size of other versions. Multi-Forth 83 is supplied with an extensive Manual (170 pages plus) and at £40+VAT it is superb value.

Order it using the coupon adding £2.30 p&p (£5 for Europe, £10 outside) or if you want more information, tick that box instead. Either way, it will put you one step ahead of the competition.

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electron user

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October sees the start of a great new series exploring the Electron's SOUND command. There's also a sound generator from Roland Waddilove, to help you create your own noises. Arcade game freaks will find all the action they crave in Breakfree while Alphaswap gives the more cerebral something to think about. Our reviewers assess the First Byte printer interface and Acornsoft's FORTH while the beginners article concludes the FOR . . . NEXT saga. With a multicharacter generator, a palindrome tester and yet more sideways scrolling, it's the best issue yet.

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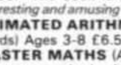

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## Paged Ram listing

*From Page 78*

```
   10 REM *************************
   20 REM *                       *
   30 REM *       PAGED RAM       *
   40 REM *    by G.A.PHILIP      *
   50 REM *   (C) MICRO USER      *
   60 REM *************************
   70 osrdch=&FFE0:oswrch=&FFEE
   80 osnewl=&FFE7:osbyte=&FFF4
   90 FORI%=0 TO 3 STEP 3
  100 P%=&8000
  110 [OPTI%
  120 .ram \for explanations see arti
cle
  130 JMP langentry
  140 JMP serviceentry
  150 EQUB &82
  160 EQUB &11
  170 EQUB &01
  180 .title
  190 EQUS "RAM"
  200 EQUB &20
  210 EQUS "1.00"
  220 EQUB &00
  230 EQUS "(C)1984 G.A.PHILIP"
  240 EQUB &00
  250 .serviceentry
  260 PHP
  270 CMP #4
  280 BEQ unreccomm
  290 CMP #9
  300 BEQ help
  310 PLP
  320 RTS
  330 .help
  340 PHA
  350 TXA
  360 PHA
  370 TYA
  380 PHA
  390 JSR osnewl
  400 LDX #0
  410 .titleloop
  420 LDA title,X
  430 JSR oswrch
  440 INX
  450 CPX #8
  460 BNE titleloop
  470 JSR osnewl
  480 .out
  490 PLA
  500 TAY
  510 PLA
  520 TAX
  530 PLA
  540 PLP
  550 RTS
  560 .unreccomm
  570 PHA
  580 TXA
  590 PHA
  600 TYA
  610 PHA
  620 LDX #0
  630 .unrecogloop
  640 LDA (&F2),Y
  650 CMP title,X
  660 BNE notthisrom
  670 INY
  680 INX
  690 CPX #3
  700 BNE unrecogloop
  710 LDA (&F2),Y
  720 CMP #ASC("L")
  730 BEQ languageentry
  740 JMP demonstration
  750 .notthisrom
  760 JMP out
  770 .languageentry
  780 LDX &F4
  790 LDA #&8E
  800 JSR osbyte
  810 .exit
  820 PLA
  830 PLA
  840 PLA
  850 PLA
  860 LDA #0
  870 RTS
  880 .langentry
  890 CLI \enable interrupts
  900 .demonstration
  910 .hexandasciidump
  920 LDA #&80 \start from &8000
  930 STA &F3
  940 LDA #0
  950 STA &F2
  960 .newblock
  970 LDX #0 \ x holds no of lines
  980 .newline
  990 JSR osnewl \blank line for neat
ness
 1000 LDA &F3 \print address
 1010 JSR hextoascii
 1020 LDA &F2
 1030 JSR hextoascii
 1040 JSR space \space for neatness
 1050 LDY #0
 1060 .hexcontents   \print ?&8000,Y
 1070 LDA (&F2),Y    \in hex
 1080 JSR hextoascii
 1090 JSR space
 1100 INY
 1110 CPY #8         \in blocks of 8
 1120 BNE hexcontents
 1130 JSR space
 1140 LDY #0
 1150 .asciicontents \and then in ASC
II
 1160 LDA (&F2),Y
 1170 CMP #32
 1180 BCC printadot \A<=31 not contro
l
 1190 CMP #127       \or user characte
rs
 1200 BCS printadot \A>=127
 1210 JMP print
 1220 .printadot \print a dot instead
 1230 LDA #ASC(".")
 1240 .print
 1250 JSR oswrch
 1260 INY
 1270 CPY #8 \in blocks of 8
 1280 BNE asciicontents
 1290 CLC
 1300 LDA &F2 \increase address by 8
 1310 ADC #8
 1320 STA &F2
 1330 LDA &F3
 1340 ADC #0
 1350 STA &F3
 1360 INX
 1370 CPX #8 \8 lines yet?
 1380 BNE newline
 1390 JSR osnewl \blank line for neat
ness
 1400 JSR osrdch \wait for instructio
ns
 1410 CMP #32 \space bar?
 1420 BEQ newblock \yes - print block
 1430 JSR osnewl   \no - print blank
line
 1440 JMP exit     \then exit
 1450 .hextoascii \split a byte into
 1460 PHA          \two nibbles
 1470 LSR A
 1480 LSR A
 1490 LSR A
 1500 LSR A
 1510 JSR printascii \ and print each
as
 1520 PLA            \ an ASCII chara
cter
 1530 AND #&0F       \ 0 to F
 1540 JSR printascii
 1550 RTS
 1560 .space
 1570 LDA #32
 1580 JSR oswrch
 1590 RTS
 1600 .printascii \print a hex number
 1610 CLC          \ in ASCII ie 0=&48
 1620 ADC #48
 1630 CMP #58 \for 0-9
 1640 BCC over
 1650 ADC #6 \for A-F
 1660 .over
 1670 JSR oswrch
 1680 RTS
 1690 ]
 1700 NEXT
```

*This listing is included in this month's cassette tape offer. See order form on Page 217.*

Telephone Orders 574 5271

# The Twillstar Reliability. It's what makes us The Leading Computer Shop!

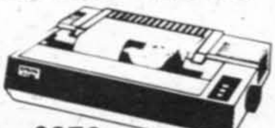
* TAKE ADVANTAGE OF OUR 24 HOUR TELEPHONE ORDERING SERVICE *

## PRINTERS

*FREE INTERFACE CABLE & 500 SHEETS OF PAPER WITH ALL PRINTERS*

### DOT MATRIX £389

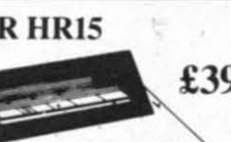
**EPSON**
FX80



**EPSON R80 ...£279**
**EPSON FX100........£489**

FX80 is even faster. An astonishing 160 characters per second, proportional spacing, quick forms tear-off, superscripts, subscripts, dot addressable graphics and down loadable characters set. Standard Centronics parallel compatible interface with optional RS-232C/current loop and IEEE interfaces. The FX80 is pin fed and friction fed and can feed single sheets (optional tractor feed).

### SHINWA CP 80

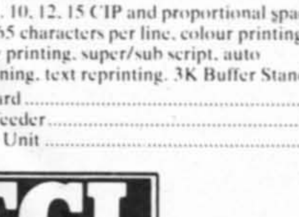


80 column, friction and adjustable tractor feed, bi-directional logic seeking HI-RES graphics and block graphics sub and super scripts, condensed and emphasised print, and underlining vertical and horizontal tabs, self test, italic print, etc.

**£230**

### BROTHER HR15

**£395**



13 CPS, 10, 12, 15 CIP and proportional spacing up to 165 characters per line, colour printing, shadow printing, super/sub script, auto underlining, text reprinting, 3K Buffer Standard.

| | |
|---|---|
| Keyboard | **£160** |
| Sheet Feeder | **£228** |
| Tractor Unit | **£109** |

TCL

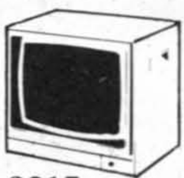
# Twillstar Computers Limited

**17 REGINA ROAD · SOUTHALL · MIDDLESEX**
**TEL: (01)574 5271 · TELEX NO. 25247 TIL**

open 6 days a week 10am–8pm

## MONITORS

*ALL MONITORS COME WITH FREE CONNECTING CABLES*



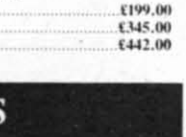
### NOVEX 14" MONITOR

Low-cost model for personal computers. 14" Screen colour display. R.G.B. and composite inputs.

**£215**

Switch to allow monitor to be used as green screen monitor. Switch mode auto-regulated power supply. Professionally-styled Metal-Cabinet in BBC Micro-colours.

### TV/MONITOR £249



**14" TV/MONITOR**

This TV Monitor is not a modified television as many TV Monitors are, but a 14" TV/Monitor which has been designed to perform both functions. It has RGB and Composits video and sound. An RGB cable for a BBC is supplied as standard. **With Remote Control.**

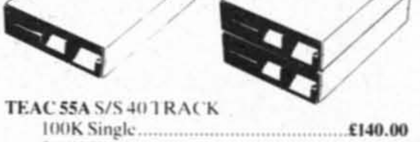
**MICROVITEC 14" Colour Monitors**

| | | |
|---|---|---|
| Microvitec 1431 14 | Std. Res | **£199.00** |
| | Med. Res | **£345.00** |
| | Hi-Res | **£442.00** |

## DISK DRIVES

**TEAC DISK DRIVES**

*INCLUDES FREE CABLES, FORMATTING DISK & MANUALS*



| | |
|---|---|
| **TEAC 55A** S/S 40 TRACK | |
| 100K Single | **£140.00** |
| 200K Dual | **£280.00** |
| **TEAC 55E** S/S 80 TRACK | |
| 200K Single | **£190.00** |
| 400 Dual | **£380.00** |
| **TEAC 55F** D/S 80 TRACK | |
| 400K Single | **£220.00** |
| 800K Dual | **£440.00** |
| Power Supply Unit (Optional) | **£29.00** |
| 40/80 Switch | **£ 8.00** |

## ACORN SPEECH SYSTEM

The system contains a Speech Processor and a special chip called a Phrase Read Only Memory (PHROM).

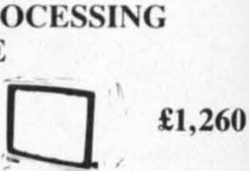
The Speech Processor contains a digital filter which is rather like a computer version of the human vocal tract. It relies on being fed to a large number of parameters to produce the necessary sounds for making speech.

**£55.00**

## DAISYWHEELS

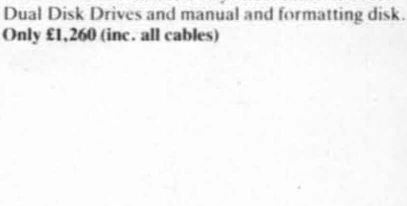
**£379**

**JUKI 6100**



20 CPS max
(13 CPS
Shannon text)
10, 12, 16 CPI
and proportional spacing up to 220 characters per line, diablo protocol, Bold, shadow printing and underlining.

## WORD PROCESSING PACKAGE



**£1,260**

BBC Model B plus Disc Interface fitted view, VDU Green Monitor, Daisywheel Printer, 200K Dual Disk Drives and manual and formatting disk. **Only £1,260 (inc. all cables)**

### *HOW TO ORDER*

You may purchase any of the items listed by cheque made payable to: Twillstar Computers Ltd. Barclaycard or Access. All you have to do is fill in your requirements on a separate sheet of paper, post to us and we will despatch within 24 hours, subject to availability. All prices inclusive of 15% VAT. ADD £2.50 P&P for orders below £150. OVER. ADD £8 P&P. CREDIT CARD HOLDERS MAY ORDER BY TELEPHONE. GIVE CARD NUMBER, NAME, ADDRESS AND ITEMS REQUIRED. PLEASE NOTE VAT IS NOT CHARGED ON EXPORT ORDERS. EXPORT CUSTOMERS. PLEASE RING FOR DETAILS OF P&P.

## Wampus listing

*From Page 85*

```
  100 REM **********************
  110 REM *                    *
  120 REM *  HUNT THE WAMPUS   *
  130 REM *  (C) Micro User    *
  140 REM *        By          *
  150 REM *   A.DENHAM  1984   *
  160 REM *                    *
  170 REM **********************
  180 MODE7
  190 PROCIN
  200 MODE4
  210 ENVELOPE1,3,-1,-2,-3,255,255,15
0,100,-3,0,-3,126,80
  220 DIM M(60)
  230 PROCMAP
  240 REM MAIN PROGRAM
  250 AR=3:REM number of arrows
  260 CL$="1A":REM start position
  270 End=0
  280 REM Locate various hazards
  290 L$=CHR$(65+RND(100)MOD3)
  300 WA$=STR$(RND(20))+L$
  310 P1$=STR$(RND(20))+"C"
  320 P2$=STR$(RND(20))+"C"
  330 B1$=STR$(RND(20))+CHR$(65+RND(1
00)MOD3)
  340 B2$=STR$(RND(20))+CHR$(65+RND(1
00)MOD3)
  350 S1$=STR$(RND(20))+CHR$(65+RND(1
00)MOD3)
  360 S2$=STR$(RND(20))+CHR$(65+RND(1
00)MOD3)
  370 REM Hazards located:check for f
orbidden locations
  380 IF WA$=B1$ OR WA$=B2$ OR WA$=S1
$ OR WA$=S2$ OR WA$=P1$ OR WA$=P2$ OR
 WA$="1A" OR WA$="2A" OR WA$="5A" OR
WA$="11A" OR WA$="1B" THEN GOTO290
  390 IF B1$=B2$ OR B1$=S1$ OR B1$=S2
$ OR B1$=P1$ OR B1$=P2$ OR B1$="1A" O
R B1$="2A" OR B1$="5A" OR B1$="11A" O
R B1$="1B" THEN GOTO290
  400 IF B2$=S1$ OR B2$=S2$ OR B2$=P1
$ OR B2$=P2$ OR B2$="1A" OR B2$="2A"
OR B2$="5A" OR B2$="11A" OR B2$="1B"
THEN GOTO290
  410 IF S1$=S2$ OR S1$=P1$ OR S1$=P2
$ OR S1$="1A" OR S1$="2A" OR S1$="5A"
 OR S1$="11A" OR S1$="1B" THEN GOTO29
0
  420 IF S2$=P1$ OR S2$=P2$ OR S2$="1
A" OR S2$="2A" OR S2$="5A" OR S2$="11
A" OR S2$="1B" THEN GOTO290
  430 REM Hazards placed and checked
  440 REM Start of main loop
  450 LV$=RIGHT$(CL$,1):REM level
  460 PROCLOC
  470 RESTORE
  480 LE=LEN(CL$):J$=LEFT$(CL$,LE-1):
REM For catching mistakes
  490 REPEAT
  500 READ N$,O$,P$,Q$,R$,S$
  510 UNTIL N$=CL$:REM locates presen
t position
  520 IF CL$=P1$ OR CL$=P2$ THEN SOUN
D1,1,200,100:PRINT"AAAAAAAAARRRGH!":P
RINT"YOU'VE FALLEN DOWN A BOTTOMLESS
PIT.":PROCDEAD:GOTO 240
  530 IF CL$=B1$ OR CL$=B2$ THEN PROC
BATS:GOTO440
  540 IF CL$=WA$ THEN PRINT"THE WAMPU
S IS IN THIS CAVE!":PRINT:PRINT"IT HA
S EATEN YOU.":PRINT:PRINT"THAT WAS RA
THER POOR HUNTING!":PROCDEAD:GOTO240
  550 IF CL$=S1$ OR CL$=S2$ THEN PROC
SPID
  560 PROCWARNINGS
  570 *FX15,1
  580 IF H=0 THEN PRINT:PRINT"NO OBVI
OUS DANGER!"
  590 PROCWAIT
  600 PROCHUNT
  610 IF G$="Y" THEN PROCSHOOT:IF End
=1 GOTO240
  620 PRINTTAB(2)"Cave ";CL$;" connec
ts to caves ":PRINT:PRINT SPC(11)O$;"
, ";P$;", ";Q$
  630 IF LV$="A"THEN 660
  640 IF LV$="B"THEN 670
  650 IF LV$="C"THEN 680
  660 PRINTTAB(2,4)"It also has a sha
ft going down to ";R$:GOTO690
  670 PRINTTAB(2,4)"It also has shaft
s up & down to ":PRINT:PRINTSPC(13)R$
;" & ";S$:GOTO690
  680 PRINTTAB(2,4)"It also has a sha
ft going up to ";R$:GOTO690
  690 PRINTTAB(1,8)"Where do you want
 to go?"
  700 *FX15,1
  710 PRINT:INPUT SPC(10) K$
  720 U$=RIGHT$(K$,1):IF U$<>"A" AND
U$<>"B" AND U$<>"C" THEN PRINT"NOT CO
MPLETE. PLEASE RE-TYPE WITH LETTER":G
OTO 710
  730 IF K$=CL$ THEN PRINT"You're alr
eady there,silly.":GOTO 710
  740 IF K$<>O$ AND K$<>P$ AND K$<>Q$
 AND K$<>R$ AND K$<>S$ THEN PRINT"YOU
 CAN'T GO STRAIGHT THERE!":PRINT"LOOK
 AT THE MAP":FOR Co=0 TO 8000:NEXT:CL
S:GOTO620
  750 CL$=K$
  760 CLS:GOTO 440
  770 REM End of main loop
  780 DEFPROCWARNINGS
  790 H=0
  800 IF O$=P1$ OR P$=P1$ OR Q$=P1$ O
R R$=P1$ OR S$=P1$ OR O$=P2$ OR P$=P2
$ OR Q$=P2$ OR R$=P2$ OR S$=P2$ THEN
H=H+1:PRINTTAB(2,7)"YOU CAN FEEL A BI
T OF A BREEZE!":PRINT"THIS MUST MEAN
THERE IS A PIT NEARBY!"
  810 IF O$=B1$ OR P$=B1$ OR Q$=B1$ O
R R$=B1$ OR S$=B1$ OR O$=B2$ OR P$=B2
$ OR Q$=B2$ OR R$=B2$ OR S$=B2$ THEN
H=H+1:PRINTTAB(2,5)"TWITTER,TWITTER!Y
OU CAN HEAR BATS!"
  820 RESTORE
  830 J=0:W=0
  840 REPEAT
  850 READ A$,B$,C$,D$,E$,F$
  860 UNTIL A$=N$ OR A$=O$ OR A$=P$ O
R A$=Q$ OR A$=R$ OR A$=S$
  870 PROCWAMPUS:J=J+1:IF LV$="A" AND
 J=5 OR LV$="C" AND J=5 OR LV$="B"AND
 J=6 THEN ENDPROC
  880 IF W=1 THEN ENDPROC
  890 GOTO840
  900 DEFPROCWAMPUS
  910 IF A$=WA$ OR B$=WA$ OR C$=WA$ O
R D$=WA$ OR E$=WA$ OR F$=WA$ THEN W=1
:GOTO920
  920 IF W=1 THEN PRINTTAB(1,10)"GOSH
!WHAT A PONG! YOU CAN SMELL WAMPUS!":
H=H+1
  930 ENDPROC
  940 DEFPROCHUNT
  950 VDU28,0,13,10,0:REM window
  960 PRINT:PRINT"Do you want":PRINT"
   to try":PRINT:PRINT"  to shoot":PR
INT:PRINT"the WAMPUS?":PRINT"     Y/N"
:PRINT:PRINT"???????????"
  970 G$=GET$:CLS:VDU28,0,31,39,19
  980 ENDPROC
  990 DEFPROCSPID
 1000 PRINT:PRINT"THE SPIDERS HAVE GO
T YOU!":FOR T=0 TO 3000:NEXT:PRINT:PR
INT"YOU ARE TANGLED UP IN THEIR WEBS!
":FOR T=0 TO 6000:NEXT:PRINT:PRINT"YO
U CAN HEAR THE WAMPUS MOVING ABOUT!!!
":FOR T=0 TO 6000:NEXT
 1010 FOR M=1 TO 2:L$=CHR$(65+INT(RND
(1)+0.5)):WA$=STR$(RND(20))+L$:IF WA$
=CL$ THEN PRINT"THE WAMPUS HAS COME I
NTO THIS CAVE!":PRINT"IT IS EATING YO
U!":PRINT"YOU ARE DEAD.":PROCDEAD:W=2
 ELSE NEXT
 1020 IF End=1 THEN ENDPROC ELSE PRIN
T:PRINT"THAT WAS LUCKY! IT HAS NOT FO
UND YOU.":PRINT:PRINT"YOU CAN GET FRE
```

→

# TCL-PANASONIC

## 3″ Disk Drive – The Choice . . .

Special!

ONLY £99 + VAT

Panasonic
B
TCL

# Twillstar Computers Offer

### INGENUITY, DURABILITY, COMPATABILITY . . .

This is the Twillstar (TCL) Panasonic 3″ Disk Drive which features the ingenious dual-sided cartridge protected disk, 200K (100K per side). Ideal for use in education and other environments where rough use is envisaged.

Compatible with all disk interfaces, comprehensive manual and utilities on either disk or EPROM.

### DESIGN, COLOUR, SIZE . . .

This 3″ Disk Drive is totally housed in a high stability aluminium two piece casing, with a light plastic face, and a unique automatic steel shutter which protects the disk surface. A highly sensitive injection key allows easy insertion and extraction of your diskette. The case is finished in a tough coating of beige to match the colour of your BBC.

The size is a compact 160mm length x 90mm wide x 55mm deep.

### FEATURES, CAPACITY, USAGE . . .

This 3″ Disk Drive uses 3″ diskettes which are handled like a cassette, 100K each side of the diskette, giving you 200K. It can be purchased with cables, formating disk and comprehensive manual. Ready to plug in and use, and remember, it is compatible with all known disk interfaces for the BBC Micro – and no extra power supply is required. The PANASONIC TCL (TWILLSTAR) 3″ Disk Drive carries a 12 MONTH PARTS AND LABOUR GUARANTEE!

### DISKETTES, SPECIFICATIONS, ACCESS . . .

You may use any 3″ Diskettes, Maxell, Panasonic, Hitachi etc; these are cassette like cartridges encaged in rigid plastic with the disk surfaces protected by a stainless steel shutter which is automatically opened and closed by the Disk Drive. Track to track access time is three ms. Data transfer rate 125 kbs-1. Dual double sided Disk Drives give 1 megabyte of on-line storage.

**TCL**

# Twillstar Computers Limited

17 REGINA ROAD, SOUTHALL, MIDDLESEX UB2 5PL TEL: (01) 574 5271

### *YOUR SPECIAL PRICES!*

**3″ TCL/PANASONIC DISK DRIVE**
**Offer Price £99 + VAT = £113.85**
(includes Manual)

**CABLES AND FORMATING DISK**
**Offer Price £19 + VAT = £21.85**

**3″ PANASONIC DISKETTES**
**Special Offer of £4.50 each**

### HOW TO ORDER

To take advantage of this special offer all you have to do is fill in the coupon below with your name and address, enclosing your cheque/P.O made payable to Twillstar Computers Ltd; if you are a Barclaycard or Access card holder, please use the coupon and post to:

**TWILLSTAR COMPUTERS LTD, 17 REGINA ROAD, SOUTHALL, MIDDLESEX**

***Post to: TWILLSTAR COMPUTERS LTD,***
***17 REGINA ROAD, SOUTHALL, MIDDLESEX.***

Please send me (No.) ____________ 3″ TCL Panasonic Disk Drives, at £113.85 inclusive of VAT, plus £3.50 post, packing and insurance.

Also send me (No.) ____________ Cable(s) for (state your micro) ____________ and Formating Disk and Manual at £23.00 each inclusive of VAT.

I would like to take advantage of 3″ Diskettes by PANASONIC please send me (No.) ____________ at £4.50 each inclusive of VAT.

I enclose my cheque/P.O. for £____________

I prefer to use my **ACCESS/BARCLAYCARD**
*(delete whichever not applicable)*

Card No. ____________

Signature ____________

Name ____________

Address ____________

____________

____________

____________

Credit cards valid if signd by card holder. Address above must be the same as the card holder.

From Page 170

```
E NOW.":FOR T=0 TO 8000:NEXT:CLS:ENDP
ROC
 1030 DEFPROCLOC
 1040 VDU28,0,17,9,13
 1050 CLS:PRINTTAB(0,1)"YOU ARE IN":P
RINT"  CAVE ";CL$
 1060 VDU28,0,31,39,18:COLOUR128:ENDP
ROC
 1070 DEFPROCBATS
 1080 PRINT:PRINT"THE BATS HAVE GOT Y
OU!":PRINT:FOR T=0 TO 3000:NEXT:PRINT
"THEY ARE CARRYING YOU AWAY!"
 1090 CL$=STR$(RND(20))+CHR$(65+RND(1
00)MOD3)
 1100 FOR T=0 TO 4000:NEXT
 1110 PRINT:PRINT"THEY'VE DROPPED YOU
 IN CAVE  "CL$:FOR T=0 TO 8000:NEXT
 1120 CLS:ENDPROC
 1130 DEFPROCDEAD
 1140 FOR Z= 1 TO 2:SOUND 1,-15,60,15
:SOUND 1,0,0,1:NEXT
 1150 SOUND 1,-15,60,5:SOUND 1,0,0,1
 1160 SOUND 1,-15,60,15:SOUND 1,0,0,1
 1170 SOUND 1,-15,72,15
 1180 SOUND 1,0,60,1
 1190 SOUND 1,-15,68,5
 1200 SOUND 1,0,0,1
 1210 SOUND 1,-15,68,15
 1220 SOUND 1,0,60,1
 1230 SOUND 1,-15,60,5
 1240 SOUND 1,0,0,1
 1250 SOUND 1,-15,60,15
 1260 SOUND 1,0,60,1
 1270 SOUND 1,-15,52,10
 1280 SOUND 1,0,60,1
 1290 SOUND 1,-15,60,40
 1300 CLS:PRINTTAB(5,7)"YOU ARE DEAD!
":End=1
 1310 PROCRERUN:CLS:ENDPROC
 1320 DEFPROCSHOOT
 1330 CLS
 1340 PRINT"YOU HAVE "STR$(AR)" MAGIC
 ARROWS.":PRINT"THEY WILL GO TO WHICH
EVER CAVES YOU WANTUP TO 3 IN A ROW."
:PRINT:PRINT"IF YOUR ARROW GOES INTO
THE SAME CAVE ASTHE WAMPUS IT KILLS T
HE POOR BEAST.":PRINT:PRINT"THEN YOU
HAVE WON."
 1350 PROCWAIT
 1360 PRINT"THE PROBLEM IS THAT YOU M
UST GIVE CLEAR,CORRECT INSTRUCTIONS."
:PRINT:PRINT"IF YOU SEND IT OFF WITH
ORDERS TO GO TO CAVES THAT ARE NOT CO
NNECTED,IN ORDER,ITWILL GO OFF AT RAN
DOM."
 1370 PRINT:PRINT"IT MIGHT EVEN COME
BACK AND KILL YOU!"
 1380 PRINT:PRINT"DO YOU STILL WANT T
O SHOOT? Y/N"
 1390 G$=GET$:CLS
 1400 IF G$="Y" THEN GOTO 1420
 1410 IF G$="N" THEN ENDPROC:ELSE GOT
O 1380
 1420 PRINT:PRINT"WHAT CAVES DO YOU W
ANT IT TO GO TO?"
 1430 PRINT:INPUT"PLEASE LIST 3  "T$,
U$,V$
 1440 IF RIGHT$(T$,1)<>"A" AND RIGHT$
(T$,1)<>"B" AND RIGHT$(T$,1)<>"C" THE
N GOTO1480
 1450 IF RIGHT$(U$,1)<>"A" AND RIGHT$
(U$,1)<>"B" AND RIGHT$(U$,1)<>"C" THE
N GOTO1480
 1460 IF RIGHT$(V$,1)<>"A" AND RIGHT$
(V$,1)<>"B" AND RIGHT$(V$,1)<>"C" THE
N GOTO1480
 1470 GOTO1490
 1480 PRINT"Sorry, numbers & letters
please":GOTO1430
 1490 IF T$<>CL$ AND T$<>O$ AND T$<>P
$ AND T$<>Q$ AND T$<>R$ AND T$<>S$ TH
EN PROCKILL:IF End=1 THEN ENDPROC:REM
 Tests for possible steps
 1500 IF T$=WA$ OR U$=WA$ OR V$=WA$ T
HEN PROCWIN:PROCRERUN
 1510 IF End=1 THEN ENDPROC
 1520 RESTORE:REPEAT:READ A$,B$,C$,G$
,E$,F$: UNTIL A$=T$
 1530 IF U$<>B$ AND U$<>C$ AND U$<>D$
 AND U$<>E$ THEN IF LV$="B" AND U$<>F
$ THEN J=RND(2):IF J=1 THEN PROCKILL:
IF End=1 THEN ENDPROC:REM Check aim
 1540 CLS:FOR Z=0 TO 2000:NEXT:PRINTT
AB(2,5)"MISSED...":FOR Z=0 TO 2000:NE
XT:PRINTSPC(11)"MISSED...":FOR Z=0 TO
 2000:NEXT:PRINTSPC(20)"MISSED!":FOR
Z=0 TO 2000:NEXT
 1550 J=RND(10):IF J<4THEN CLS:FOR Z=
0 TO 100:NEXT:PRINTTAB(2,5)"DANGER!":
FOR Z=0 TO 1000:NEXT:PRINTSPC(11)"DAN
GER!":FOR Z=0 TO 1000:NEXT:PRINTSPC(2
0)"DANGER!!!":FOR Z=0 TO 2000:NEXT
 1560 IFJ<4 THEN PRINT"YOU CAN HEAR T
HE WAMPUS MOVING ABOUT!":PRINT"SHOOTI
NG ARROWS SOMETIMES WAKES HIM UP.":L$
=CHR$(65+INT(RND(1)+0.5)):WA$=STR$(RN
D(20))+L$:IF WA$=CL$ THEN PROCEATEN:I
F End=1 THEN ENDPROC
 1570 IF J<4 THEN PRINT"YOU ARE LUCKY
 - HE HASN'T FOUND YOU.":PRINT"TAKE C
ARE NOT TO WAKE HIM UP AGAIN!"
 1580 AR=AR-1:IF AR=0 PRINT"YOU HAVE
USED UP ALL YOUR ARROWS":PRINT"THE WA
MPUS WILL CATCH YOU":PRINT"YOU MIGHT
AS WELL BE DEAD":End=1:PROCRERUN
 1590 CLS
 1600 ENDPROC
 1610 DEFPROCKILL
 1620 PRINT:PRINT"BAD INSTRUCTIONS! Y
OU HAVE SHOT YOURSELF":PROCDEAD
 1630 ENDPROC
 1640 DEFPROCIN
 1650 PRINTTAB(4,7)"Welcome to"
 1660 PRINTTAB(11,11)CHR$(141)"HUNT T
HE WAMPUS"
 1670 PRINTTAB(11,12)CHR$(141)"HUNT T
HE WAMPUS"
 1680 PROCHOLD
 1690 PRINTTAB(4,4)"You are going to
explore some caves.":PRINT"There are
three levels of caves, with":PRINT:PR
INT"twenty caves on each level.":PRIN
T:PRINT"You will see a map in a momen
t.":PROCHOLD
 1700 PRINTTAB(2,5)"Your job is to hu
nt and kill a WAMPUS.":PRINT:PRINT"Th
e WAMPUS is a fierce creature that ":
PRINT:PRINT"lives underground and eat
s people!":PRINT:PRINT"It spends most
 of its time asleep, but"
 1710 PRINT:PRINT"if anyone comes int
o its group of caves":PRINT:PRINT"it
might wake up and move around.":PRINT
:PRINT"If it finds you it will eat yo
u.":PROCHOLD
 1720 PRINTTAB(1,5)"There are some ot
her dangers down here.":PRINT:PRINT:P
RINT:PRINT"There are two colonies of
GIANT BATS.":PRINT:PRINT:PRINT"There
are two BOTTOMLESS PITS.":PRINT:PRINT
:PRINT"There are some GIANT SPIDERS."
:PROCHOLD
 1730 PRINT:PRINT:PRINT"  If you go i
nto the cave with the BATS":PRINT:PRI
NT"they will pick you up and carry yo
u":PRINT:PRINT"around until they get
tired. Then they":PRINT:PRINT"drop yo
u.":PRINT:PRINT"They might drop you i
n the same cave as"
 1740 PRINT:PRINT"the WAMPUS.":PRINT:
PRINT"Then it will eat you.":PRINT:PR
INT"You will be able to hear the BATS
 from":PRINT:PRINT"the next cave":PRO
CHOLD
 1750 PRINT:PRINT"If you go into a ca
ve with a BOTTOMLESS":PRINT:PRINT"PIT
 you will fall down it. Then you are
":PRINT"dead.":PRINT:PRINT:PRINT"You
will know when you are near a pit   "
:PRINT"because you will feel a draugh
```

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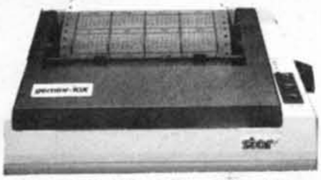
## Wampus listing

*From Page 172*

```
t when you"
 1760 PRINT"are in the cave next to i
t.":PROCHOLD
 1770 PRINT:PRINT:PRINT"You will not
see the spiders until after":PRINT"th
ey catch you.":PRINT:PRINT"Just hope
that you can get away before":PRINT:P
RINT"the WAMPUS visits your cave!":PR
OCHOLD
 1780 PRINTTAB(2,3)"To help you find
the WAMPUS":PRINT:PRINTSPC(4)"(before
 it finds you)":PRINT:PRINT"you can s
mell it from two caves away."
 1790 PRINT:PRINT:PRINT:PRINT"When yo
u think you know where the WAMPUS":PR
INT"is you can shoot it with magic ar
rows.":PRINT:PRINT:PRINT"You will fin
d out about those later."
 1800 PRINT:PRINT:PRINT SPC(7)"GOOD L
UCK":PRINTTAB(18)"(you might need it!
)"
 1810 PROCHOLD
 1820 ENDPROC
 1830 DEFPROCWIN
 1840 FOR Z=1 TO 2
 1850 SOUND 1,-15,48,8
 1860 SOUND 1,0,0,1
 1870 SOUND 1,-15,48,8
 1880 SOUND 1,0,0,1
 1890 SOUND 1,-15,48,16
 1900 SOUND 1,0,0,1
 1910 NEXT
 1920 FOR Z=1 TO 2
 1930 SOUND 1,-15,64,8
 1940 SOUND 1,0,0,1
 1950 NEXT
 1960 SOUND 1,-15,64,16
 1970 SOUND 1,0,0,1
 1980 SOUND 1,-15,56,4
 1990 SOUND 1,0,0,1
 2000 SOUND 1,-15,48,16
 2010 FOR J=1 TO 5
 2020 FOR K=0 TO 7
 2030 VDU19,1,K;0;
 2040 FOR L=1 TO 250:NEXT
 2050 NEXT:NEXT
 2060 VDU19,1,7;0;
 2070 PRINT"YOU'VE KILLED IT":PRINT:P
RINT"WELL DONE.":End=1
 2080 ENDPROC
 2090 DEFPROCHOLD:PRINTTAB(8,23)"Pres
s SPACE BAR to go on":K=GET:CLS:ENDPR
OC
 2100 DEFPROCWAIT:PRINTTAB(8,11)"Pres
s SPACE BAR to go on":G$=GET$:CLS:END
PROC
 2110 DEFPROCMAP
 2120 VDU23,240,255,255,255,255,255,2
55,255,255
 2130 VDU 29,810;772;
 2140 FOR Z=1 TO 360:READ A$:NEXT
 2150 VDU5
 2160 FOR C=1 TO 4
 2170 J=0:V=0
 2180 FOR U=1 TO 4
 2190 J=J+1
 2200 IF U=1 THEN S=290
 2210 IF U=2 THEN S=150
 2220 IF U=3 THEN S=210
 2230 IF U=4 THEN S=80
 2240 FOR AN=0 TO 359 STEP 72
 2250 X=1.5*S*SIN(RAD(AN-36*(J MOD 2)
))
 2260 Y=S*COS(RAD(AN-36*(J MOD 2)))
 2270 V=V+1
 2280 ON C GOSUB 2330,2340,2400,2420
 2290 NEXT:NEXT:NEXT
 2300 VDU4
 2310 GOTO 2430
 2320 REM Subroutines for graphics
 2330 M(3*V-2)=INT(V):M(3*V-1)=INT(X)
:M(3*V)=INT(Y):RETURN
 2340 READ P,Q,R,S
 2350 A=M(3*P-1)+16:B=M(3*P)-16
 2360 MOVE A,B:DRAW(M(3*Q-1)+16),(M(3
*Q)-16)
 2370 MOVE A,B:DRAW (M(3*R-1)+16),(M(
3*R)-16)
 2380 MOVE A,B:DRAW M(3*S-1)+16,M(3*S
)-16
 2390 RETURN
 2400 MOVE X,Y
 2410 PRINTCHR$ 240;CHR$ 240:RETURN
 2420 GCOL0,0:MOVE X,Y:PRINT;V:RETURN
 2430 ENDPROC
 2440 DEFPROCRERUN
 2450 PRINT:PRINT"Do you want to have
 another game? Y/N"
 2460 *FX15,1
 2470 G$=GET$:IF G$="Y" THEN PRINT"Ok
ay, everything is being moved.....":G
OTO2490
 2480 IF G$="N" THEN PRINT"O.K.":PRIN
TSPC(10)"GOODBYE":END:ELSE GOTO2450
 2490 FOR Z=0 TO 6000:NEXT
 2500 FOR Z= 1 TO 5
 2510 VDU19,1,0;0;:FOR M=0 TO 250:NEX
T
 2520 VDU19,1,1;0;:FOR M=0 TO 250:NEX
T
 2530 NEXT
 2540 CLS:PRINT"OKAY, HERE WE GO":FOR
 Z=0 TO 4000:NEXT:VDU19,1,7;0;:CLS
 2550 ENDPROC
 2560 DATA "1A","2A","5A","11A","1B",
"0"
 2570 DATA "2A","1A","12A","3A","2B",
"0"
 2580 DATA "3A","2A","13A","4A","3B",
"0"
 2590 DATA "4A","3A","14A","5A","4B",
"0"
 2600 DATA "5A","4A","15A","1A","5B",
"0"
 2610 DATA "6A","12A","11A","16A","6B
","0"
 2620 DATA "7A","12A","13A","17A","7B
","0"
 2630 DATA "8A","13A","14A","18A","8B
","0"
 2640 DATA "9A","14A","19A","15A","9B
","0"
 2650 DATA "10A","20A","11A","15A","1
0B","0"
 2660 DATA "11A","10A","1A","6A","11B
","0"
 2670 DATA "12A","2A","6A","7A","12B"
,"0"
 2680 DATA "13A","3A","7A","8A","13B"
,"0"
 2690 DATA "14A","8A","9A","4A","14B"
,"0"
 2700 DATA "15A","9A","5A","10A","15B
","0"
 2710 DATA "16A","6A","17A","20A","16
B","0"
 2720 DATA "17A","7A","16A","18A","17
B","0"
 2730 DATA "18A","17A","8A","19A","18
B","0"
 2740 DATA "19A","18A","9A","20A","19
B","0"
 2750 DATA "20A","19A","10A","16A","2
0B","0"
 2760 DATA "1B","2B","5B","11B","1A",
"1C"
 2770 DATA "2B","1B","12B","3B","2A",
"2C"
 2780 DATA "3B","2B","13B","4B","3A",
"3C"
 2790 DATA "4B","3B","14B","5B","4A",
"4C"
 2800 DATA "5B","4B","15B","1B","5A",
"5C"
 2810 DATA "6B","12B","11B","16B","6A
","6C"
 2820 DATA "7B","12B","13B","17B","7A
","7C"
 2830 DATA "8B","13B","14B","18B","8A
","8C"
 2840 DATA "9B","14B","19B","15B","9A
","9C"
 2850 DATA "10B","20B","11B","15B","1
```

→

# star ATTRACTIONS



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# Wampus listing

*From Page 174*

```
0A","10C"
 2860 DATA "11B","10B","1B","6B","11A
","11C"
 2870 DATA "12B","2B","6B","7B","12A"
,"12C"
 2880 DATA "13B","3B","7B","8B","13A"
,"13C"
 2890 DATA "14B","8B","9B","4B","14A"
,"14C"
 2900 DATA "15B","9B","5B","10B","15A
","15C"
 2910 DATA "16B","6B","17B","20B","16
A","16C"
 2920 DATA "17B","7B","16B","18B","17
A","17C"
 2930 DATA "18B","17B","8B","19B","18
A","18C"
 2940 DATA "19B","18B","9B","20B","19
A","19C"
 2950 DATA "20B","19B","10B","16B","2
0A","20C"
 2960 DATA "1C","2C","5C","11C","1B",
"0"
 2970 DATA "2C","1C","12C","3C","2B",
"0"
 2980 DATA "3C","2C","13C","4C","3B",
"0"
 2990 DATA "4C","3C","14C","5C","4B",
"0"
 3000 DATA "5C","4C","15C","1C","5B",
"0"
 3010 DATA "6C","12C","11C","16C","6B
","0"
 3020 DATA "7C","12C","13C","17C","7B
","0"
 3030 DATA "8C","13C","14C","18C","8B
","0"
 3040 DATA "9C","14C","19C","15C","9B
","0"
 3050 DATA "10C","20C","11C","15C","1
0B","0"
 3060 DATA "11C","10C","1C","6C","11B
","0"
 3070 DATA "12C","2C","6C","7C","12B"
,"0"
 3080 DATA "13C","3C","7C","8C","13B"
,"0"
 3090 DATA "14C","8C","9C","4C","14B"
,"0"
 3100 DATA "15C","9C","5C","10C","15B
","0"
 3110 DATA "16C","6C","17C","20C","16
B","0"
 3120 DATA "17C","7C","16C","18C","17
B","0"
 3130 DATA "18C","17C","8C","19C","18
B","0"
 3140 DATA "19C","18C","9C","20C","19
B","0"
 3150 DATA "20C","19C","10C","16C","2
0B","0"
 3160 DATA 1,2,11,5,2,1,12,3,3,2,13,4
,4,3,14,5,5,4,15,1,6,11,16,12,7,12,17
,13,8,13,18,14,9,14,19,15,10,15,20,11
,11,10,1,6,12,6,7,2,13,8,7,3,14,9,8,4
;15,9,5,10,16,6,20,17,17,16,7,18,18,1
7,8,19,19,18,9,20,20,19,16,10
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*This listing is included in this month's cassette tape offer. See order form on Page 217.*

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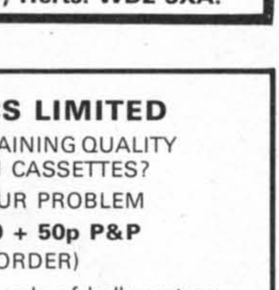

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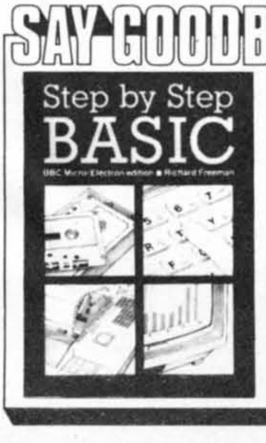

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| ZX Spectrum program tape | £5.50 |

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## 7 COLOUR PRINTER!

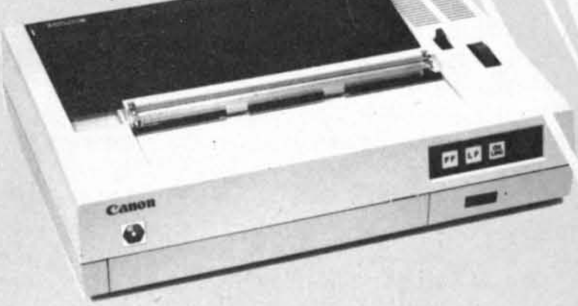
## Canon PJ 1080A Colour Ink–Jet Printer

**The ultimate in producing print-outs in 7 VIVID colours!**

**Twillstar Computers Offer £399** inclusive of VAT! Please add £8 p & p.

***Price includes free cable.**

Telephone Orders 574 5271



The Canon Ink-Jet Printer has many features, but its main feature is the capping mechanism with completely sealed ink supply operation! Capping prevents the ink from drying out and dust particles from clogging up the nozzles, giving you clear beautiful colour print-outs!

Office or home this is the ultimate in Colour!... at £399 inclusive of VAT it's worth switching right now!

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* 37 cps, Bi-directional printing.
* High-resolution graphics.
* Extremely quiet, less than 50dB.
* Will print on acetate sheets, for overhead projection.
* Long life ink cartridges – 3.5 million characters per Colour!
* Very compact and lightweight.
* 8-Bit Parallel int-Epson compatible.
* Easily replaced Colour Cartridges.
* Accepts single sheets.
* International character sets.

**HOW TO ORDER**

To purchase the Canon PJ 1080A printer, simply write your name and address on a piece of paper, and post to the address below, enclosing your cheque/P.O. made payable to Twillstar Computers Ltd.

**Credit Cards** If you are a Credit Card holder, simply use the telephone to place your order.

**TCL**

BARCLAYCARD VISA

**Twillstar Computers Limited**

17 REGINA ROAD, MIDDLESEX UB2 5P2. TEL: (01) 574 5271

# Split Screen listing

## *From Page 94*

```
    5  REM (c) Micro User
   10        **************
   20            MODE0
   40          PROCINIT
   60             END
   70        ***************
   80
   90 DEF PROCINIT
  100 ************
  110
  120 C%=0:L%=7:W%=1:CLS
  130 *FX219,138
  140 PROCK
  150
  160 ENDPROC
  170
  180 DEF PROCK
  190 **********
  200
  210 RESTORE350:PROCDISPLAY
  220
  230 *KEY 0 W%=1:PROC_W_CALL(W%)¦M
  240 *KEY 1 W%=2:PROC_W_CALL(W%)¦M
  250 *KEY 2 W%=3:PROC_W_CALL(W%)¦M
  260 *KEY 3 W%=4:PROC_W_CALL(W%)¦M
  270 *KEY 4 W%=5:PROC_W_CALL(W%)¦M
  280 *KEY 5 G=GET:W%=VAL(CHR$(G))+1:
PROC_W_CALL(W%)¦M
  290 *KEY 6 V%=0 ¦M
  300 *KEY 7 LISTO L%¦M L%=(L%+7)MOD1
4¦M
  310 *KEY 8 VDU10¦M ¦N LIST ¦M
  320 *KEY 9 VDU10¦M ¦N LIST 740,¦M
  330 *KEY 10PROCK1¦M
  340
  350 DATA W  0,W  1,W  2,W  3,W  4,W
 0-9,(CLS),LISTO,LIST,L.n
  360
  370 ENDPROC
  380
  390 DEF PROCK1
  400 **********
  410
  420 RESTORE540:PROCDISPLAY
  430
  440 *KEY 0 MO.0:PROCINIT
  450 *KEY 1 RENUMBER ¦M
  460 *KEY 2 PROCK2 ¦M
  470 *KEY 3 RUN¦M
  480 *KEY 4 AUTO
  490 *KEY 5 DELETE
  500 *KEY 6 P."TOP= ";TOP ¦M
  510 *KEY 7 C%=(C%+1)MOD2 ¦M
  520 *KEY 10 PROCK ¦M
  530
  540 DATA MO. 0,REN.,K2,RUN,AUTO,DEL
.,TOP,INVC%,LIST,L.n
  550
  560 ENDPROC
  570
  580 DEF PROCK2
  590 **********
  600
  610 RESTORE690:PROCDISPLAY
  620
  630 *KEY 1 *EXEC"
  640 *KEY 2  CH.  "
  650 *KEY 3 *CAT ¦M
  660 *KEY 4  SAVE "
  670 *KEY 5 *SPOOL"
  680
  690  DATA MO.0,*EXEC,CH.,*CAT,SAVE,
SPOOL,TOP,LISTO,LIST,L.n
  700
  710 ENDPROC
  720
  730 DEF PROCDISPLAY
  740 ***************
  750
  760 REM creates 10 windows at top o
f screen displaying key functions
  770
  780 V%=1:VP=VPOS
  790 FOR F = 0 TO 72 STEP 8
  800 PROCWINDOW(F,4,F+8-(F)DIV71,1)
  810 READ A$
  820 PRINTTAB(1,0);F/8;" ";TAB(1);A$
;
  830 NEXT
  840 V%=0:PROC_W_CALL(W%):VDU31,0,VP
  850
  860 ENDPROC
  870
  880 DEF PROC_W_CALL(W)
  890 ***************
  900
  910 REM passes one of ten predeterm
ined sets of parameters to PROCWINDOW
  920
  930 ON W GOSUB 950,960,970,980,990,
1000,1010,1020,1030,1040:GOTO 1060
  940
  950 PROCWINDOW( 0,31,79, 4):RETURN
  960 PROCWINDOW( 0,31,40, 4):RETURN
  970 PROCWINDOW(40,31,79, 4):RETURN
  980 PROCWINDOW( 0,31,40,12):RETURN
  990 PROCWINDOW(40,31,79,12):RETURN
 1000 PROCWINDOW( 0,31,40,24):RETURN
 1010 PROCWINDOW(40,31,79,24):RETURN
 1020 PROCWINDOW( 0,12,79, 4):RETURN
 1030 PROCWINDOW( 0,31,79,12):RETURN
 1040 PROCWINDOW( 0,31,79,19):RETURN
 1050
 1060 V%=1
 1070 ENDPROC
 1080
 1090 DEF PROCWINDOW(x,y,a,b)
 1100 ***********************
 1110
 1120 COLOURC%
 1130 VDU28,x,y,a,b
 1140 IF V%>0 VDU17,128+C%,12
 1150 VDU28,x+1,y-1,a-1,b+1
 1160 IF V%>0 VDU17,129-C%,12
 1170 ENDPROC
 1180
 1190 DEF PROCDEMO
 1200 ************
 1210
 1220 REM: List this procedure on scr
een 1 then type PROCDEMO
 1230
 1240 INPUT" Do you want a black back
ground (1) or a white one (0) - (0/1)
 ",C%
 1250 PROC_W_CALL(5)
 1260
 1270 FOR X=1 TO 100:PRINT"   WHEN  X
 = ";X,"X Squared = ";X^2:NEXT
 1280
 1290 ENDPROC
 1300
 1310 REM C%   controls inverse colou
rs
 1320 REM L%   controls LIST options
 1330 REM V% = 1 when window is clear
ed
 1340 REM W% = no. of text window
```

*This listing is included in this month's cassette tape offer. See order form on Page 217.*

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Telephone Orders 574 5271

*Price includes free printer cable

. . . If you are looking for high-speed, high quality printing in one compact unit, then this Canon PW-1080A unit is for you. Couple that with the special fully inclusive Twillstar offer price of £289, and you have a really exceptional bargain!

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**HOW TO ORDER**
To purchase the Canon PW-1080A printer, simply write your name and address on a piece of paper, and post to the address below, enclosing your cheque/P.O. made payable to Twillstar Computers Ltd.
If you are a Credit Card Holder, simply use the telephone to place your order.

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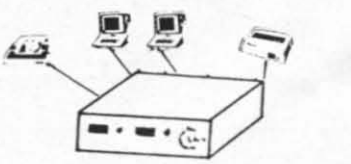

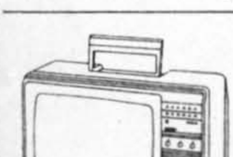

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| | |
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"X" £65.00 Inc VAT

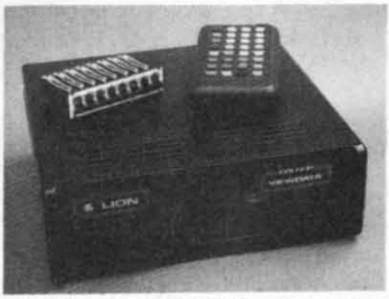
**HOW TO ORDER**

By post. Enclose Cheque/P.O. made payable to CARE Electronics. Or use ACCESS. Allow 7 days for delivery. Please add carriage. CPX2 £8.00 Other items £3.00.

*From Page 115*

```
   10 REM*****************************
   20 REM**   ESCAPE THE GOULOGS    **
   30 REM**           BY            **
   40 REM**       PHIL BROOKS       **
   50 REM**    (c) Micro User       **
   60 REM*****************************
   70 HI1%=1000:HI2%=2000:HI3%=3000:H
I4%=4000:HI5%=4000
   80 ONERRORGOTO90
   90 MODE7:VDU 23;8202;0;0;0;
  100 PROCINST
  110 MODE5
  120 S%=0:BON%=0:I=0:LIV%=6:Z%=0
  130 VDU19,3,1+LEV%,0,0,0
  140 VDU19,2,2+LEV%,0,0,0
  150 IFM%<5THENGOTO190
  160 IFLIV%=0THENPROCEND
  170 COLOUR2:VDU23;8202;0;0;0;:PRINT
TAB(6,16);"LEVEL  ";LEV%;:COLOUR1
  180 FORF=0TO5000:NEXT:CLS
  190 ENVELOPE1,1,0,0,0,0,0,0,60,-5,-
2,-3,120,40
  200 ENVELOPE2,4,0,0,0,0,0,0,20,-14,
-8,-8,120,50
  210 *FX4,1
  220 VDU23,224,0,3,7,7,15,15,15,15,2
3,225,0,192,224,224,240,240,240,240,2
3,226,15,15,15,15,7,7,3,0,23,227,240,
240,240,240,224,224,192,0,23,228,0,60
,126,126,255,255,255,255,23,229,255,2
55,255,255,126,126,60,0
  230 VDU23,230,8,8,4,4,2,2,1,1,23,23
1,128,128,64,64,32,32,16,16,23,232,12
8,128,128,128,64,64,64,64,23,233,32,3
2,32,32,16,16,16,16,23,234,8,8,8,8,8,
8,8,8,23,236,4,4,4,4,8,8,8,8,23,237,1
,1,1,1,2,2,2,2,23,238,16,16,32,32,64,
64,128,128
  240 VDU23,239,1,1,2,2,4,4,8,8,23,24
0,24,60,60,60,60,60,60,24,23,241,16,1
6,32,32,64,64,128,128
  250 VDU23,242,1,3,7,15,15,31,31,31,
23,243,31,31,15,15,9,9,31,31,23,244,3
1,31,63,63,63,127,127,127,23,245,31,3
1,31,63,63,31,63,63,23,246,31,31,31,1
5,15,7,7,3
  260 VDU23,247,192,48,12,195,51,12,4
8,192,23,248,128,192,224,240,240,248,
248,248,23,249,248,248,240,240,144,14
4,248,248,23,250,248,248,252,252,252,
254,254,254,23,251,248,248,248,252,25
2,248,252,252,23,252,248,248,248,240,
240,224,224,192
  270 VDU23,253,3,12,48,195,204,48,12
,3
  280 VDU23;8202;0;0;0;
  290 PROCMAP
  300 PROCFACE1(12,3):PROCFACE1(19,21
)
  310 IFLEV%>2THENPROCFACE2(2,3)
  320 PROCSTART
  330 FORB%=0TO4
  340 C%=B%-1
  350 PROCBCHECK
  360 Z%=Z%+1
  370 IFZ%>40-4*LEV%ANDC%<>-1THENPROC
BBANG
  380 FORF=0TO100-33*(LEV%-1):NEXT
  390 PROCBAL1
  400 PROCSTR1
  410 IFLEV%>2ANDX%<3+LEV%ANDX%>2ANDY
%=5THENPROCBLOWCHECK2(3,6)
  420 NEXTB%
  430 PROCMOVER1
  440 *FX15,1
  450 FORB%=4TO0STEP-1
  460 C%=B%+1
  470 PROCBCHECK
  480 Z%=Z%+1
  490 IFZ%>40-4*LEV%ANDC%<>5THENPROCB
BANG
  500 FORF=0TO100-33*(LEV%-1):NEXT
  510 PROCBAL2
  520 PROCSTR2
  530 IFX%>9-LEV%ANDX%<10ANDY%=5THENP
ROCBLOWCHECK1(11,6)
  540 IFX%>16-LEV%ANDX%<17ANDY%=23THE
NPROCBLOWCHECK1(18,24)
  550 NEXTB%
  560 PROCMOVER2
  570 *FX15,1
  580 IFX%=16ANDY%=1THENPROCGOAL:IFM%
=5THENGOTO130
  590 GOTO330
  600 DEFPROCBAL1
  610 IFB%=0THENPRINTTAB(X%,Y%);CHR$2
28;:VDU10,8,229:ENDPROC
  620 IFB%=1THENPRINTTAB(X%,Y%);CHR$2
24;:VDU225,10,8,8,226,227:ENDPROC
  630 IFB%=2THENPRINTTAB(X%+1,Y%);CHR
$228;:VDU10,8,229:PRINTTAB(X%,Y%);CHR
$32;:VDU10,8,32:ENDPROC
  640 IFB%=3THENPRINTTAB(X%+1,Y%);CHR
$224;:VDU225,10,8,8,226,227:ENDPROC
  650 IFB%=4THENPRINTTAB(X%+2,Y%);CHR
$228;:VDU10,8,229:PRINTTAB(X%+1,Y%);C
HR$32;:VDU10,8,32
  660 ENDPROC
  670 DEFPROCBAL2
  680 IFB%=0THENPRINTTAB(X%,Y%);CHR$2
28;:VDU10,8,229:PRINTTAB(X%+1,Y%);CHR
$32;:VDU10,8,32:ENDPROC
  690 IFB%=1THENPRINTTAB(X%,Y%);CHR$2
24;:VDU225,10,8,8,226,227:ENDPROC
  700 IFB%=2THENPRINTTAB(X%+1,Y%);CHR
$228;:VDU10,8,229:PRINTTAB(X%+2,Y%);C
HR$32;:VDU10,8,32:ENDPROC
  710 IFB%=3THENPRINTTAB(X%+1,Y%);CHR
$224;:VDU225,10,8,8,226,227:ENDPROC
  720 IFB%=4THENPRINTTAB(X%+2,Y%);CHR
$228;:VDU10,8,229
  730 ENDPROC
  740 DEFPROCSTR1
  750 IFB%=0THENPRINTTAB(X%,Y%+2);CHR
$230;:VDU10,231:ENDPROC
  760 IFB%=1THENPRINTTAB(X%+1,Y%+2);C
HR$232;:VDU10,8,233:PRINTTAB(X%,Y%+2)
;CHR$32;:ENDPROC
  770 IFB%=2THENPRINTTAB(X%+1,Y%+2);C
HR$234;:VDU10,8,234:ENDPROC
  780 IFB%=3THENPRINTTAB(X%+1,Y%+2);C
HR$237;:VDU10,8,236:ENDPROC
  790 IFB%=4THENPRINTTAB(X%+2,Y%+2);C
HR$238;:VDU10,8,8,239:PRINTTAB(X%+1,Y
%+2);CHR$32;
  800 ENDPROC
  810 DEFPROCSTR2
  820 IFB%=0THENPRINTTAB(X%,Y%+2);CHR
$230;:VDU10,231:PRINTTAB(X%+1,Y%+2);C
HR$32;:ENDPROC
  830 IFB%=1THENPRINTTAB(X%+1,Y%+2);C
HR$232;:VDU10,8,233:ENDPROC
  840 IFB%=2THENPRINTTAB(X%+1,Y%+2);C
HR$234;:VDU10,8,234:ENDPROC
  850 IFB%=3THENPRINTTAB(X%+1,Y%+2);C
HR$237;:VDU10,8,236:PRINTTAB(X%+2,Y%+
2);CHR$32;:ENDPROC
  860 IFB%=4THENPRINTTAB(X%+2,Y%+2);C
HR$238;:VDU10,8,8,239
  870 ENDPROC
  880 DEFPROCMAP
  890 RESTORE
  900 LOCALA,B,C,D,E
  910 GCOL0,2:FORG=1TO19:READA,B,C,D,
E
  920 MOVEA,B:DRAWA,C:PLOT85,D,C:PLOT
85,D,B:PLOT85,A,B
  930 SOUND1,-15,E,2
  940 NEXT:ENDPROC
  950 DATA0,0,118,1279,53,0,118,1023,
54,61,54,490,1024,118,69,118,554,1024
,182,77,182,874,1024,246,85,246,938,1
023,778,93,778,426,1023,950,101,842,3
62,426,950,93,906,298,362,950,85,950,
298,470,1014,77
  960 DATA950,842,1023,1014,69,1014,1
002,1023,1279,61,1226,118,1002,1279,5
3,1162,618,694,1226,61,266,330,374,39
4,69,394,118,726,502,77,502,118,630,5
66,85
  970 DATA566,118,278,630,93,630,118,
214,694,101
  980 DEFPROCBCHECK
  990 IFB%=0ORB%=2ORB%=4 THENGOTO1030
 1000 IFPOINT(64*(X%+B%DIV2),1023-32*
Y%)=2 ORPOINT(64*(X%+B%DIV2),1023-32*
```

→



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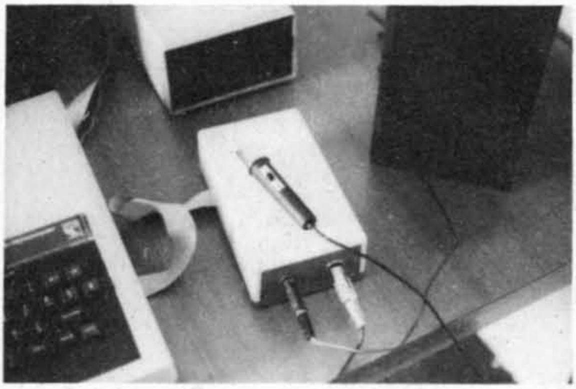

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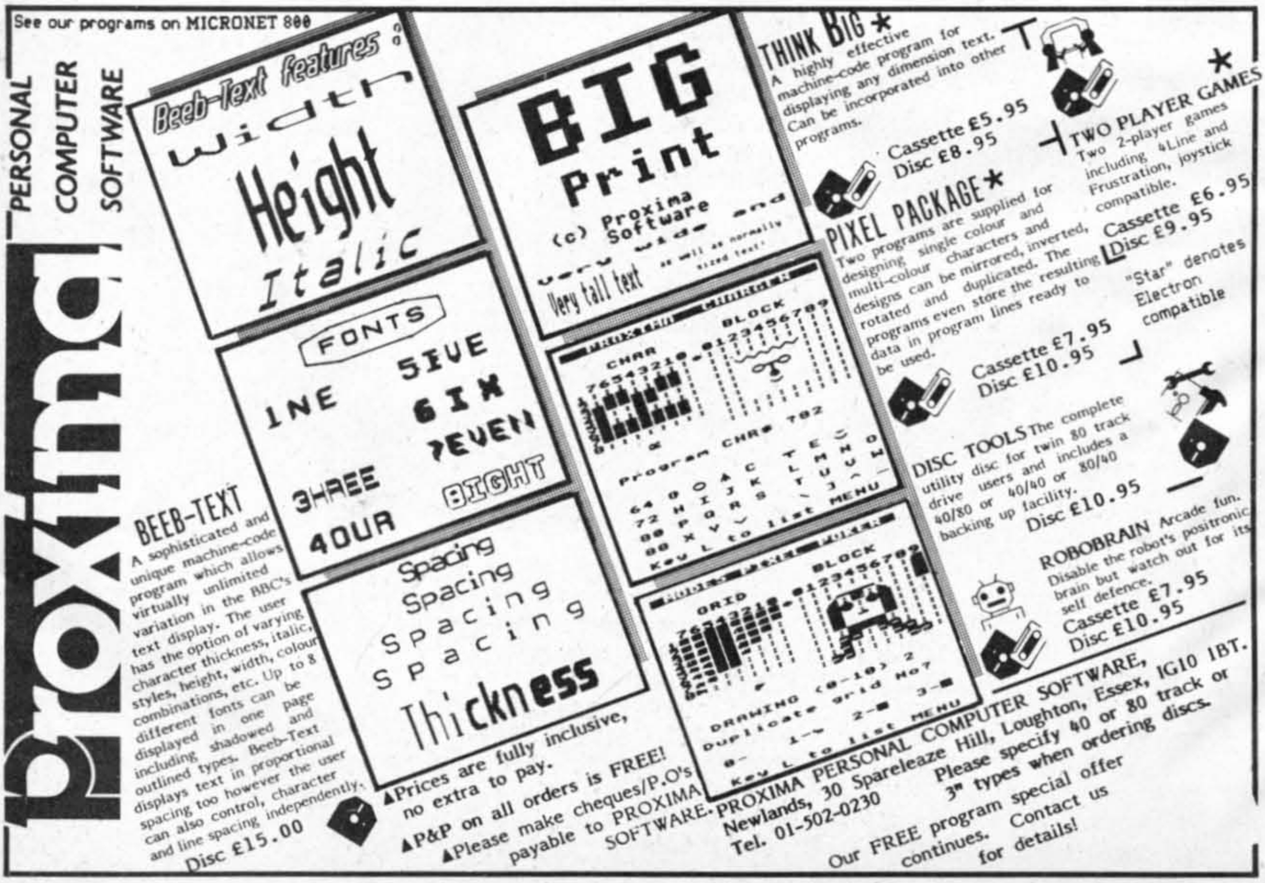
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# Escape the Goulogs listing

*From Page 181*

```
(Y%+2))=2 ORPOINT(64*(X%+2+B%DIV2),10
23-32*Y%)=2 ORPOINT(64*(X%+2+B%DIV2),
1023-32*(Y%+2))=2 ORPOINT(64*(X%+2+B%
DIV2),1023-32*(Y%+1))=2 THENPROCBBANG

 1010 IFX%=2ANDY%<7ANDPOINT(64*(X%-.5
+B%DIV2),1023-32*Y%)=2 THENPROCBBANG
 1020 IFPOINT(64*(X%+1.5+B%DIV2),1023
-32*Y%)=2 ORPOINT(64*(X%+1.5+B%DIV2),
1023-32*(Y%+2))=2 THENPROCBBANG:GOTO1
040
 1030 IFPOINT(64*(X%+B%DIV2),1023-32*
Y%)=2 ORPOINT(64*(X%+(B%+2)DIV2),1023
-32*Y%)=2 ORPOINT(64*(X%+B%DIV2),1023
-32*(Y%+2))=2 ORPOINT(64*(X%+(B%+2)DI
V2),1023-32*(Y%+2))=2 ORPOINT(64*(X%+
(B%+2)DIV2),1023-32*(Y%+1))=2 THENPRO
CBBANG
 1040 IFPOINT(64*(X%+1),1023-32*(Y%+3
))=2 ORPOINT(64*(X%+2),1023-32*(Y%+3)
)=2 ORPOINT(64*(X%+1),1023-32*(Y%+4))
=2 ORPOINT(64*(X%+2),1023-32*(Y%+4))=
2 THENPROCBBANG
 1050 IFB%=0 ANDPOINT(64*(X%+.5),1023
-32*(Y%+3))=2 THENPROCBBANG
 1060 IFB%=4 ANDPOINT(64*(X%+2.5),102
3-32*(Y%+3))=2 THENPROCBBANG
 1070 ENDPROC
 1080 DEFPROCMOVECHECK1
 1090 IFI<>136THENGOTO1120
 1100 IFPOINT(64*(X%+2),1023-32*Y%)=2
 ORPOINT(64*(X%+2),1023-32*(Y%+2))=2
ORPOINT(64*(X%+1),1023-32*(Y%+3))=2 T
HENPROCBANG1(X%+3,Y%):ENDPROC
 1110 IFX%=1ANDY%<5ANDPOINT(64*(X%+.5
),1023-32*(Y%+3))=2 THENPROCBANG1(X%+
3,Y%)
 1120 IFI<>137THENGOTO1150
 1130 IFPOINT(64*(X%+2.5),1023-32*(Y%
+3))=2 ORPOINT(64*(X%+2.5),1023-32*Y%
)=2 ORPOINT(64*(X%+2.5),1023-32*(Y%+2
))=2 ORPOINT(64*(X%+1.5),1023-32*(Y%+
4))=2 ORPOINT(64*(X%+2.5),1023-32*(Y%
+1))=2 THENPROCBANG1(X%+1,Y%):ENDPROC
 1140 IFX%=10ANDY%<5ANDPOINT(64*(X%+3
.5),1023-32*Y%)=2 THENPROCBANG1(X%+1,
Y%)
 1150 IFI<>65THENGOTO1170
 1160 IFPOINT(64*(X%+2),1023-32*Y%)=2
 ORPOINT(64*(X%+3),1023-32*Y%)=2 ORPO
INT(64*(X%+1),1023-32*(Y%+3))=2 THENP
ROCBANG1(X%+2,Y%+1):ENDPROC
 1170 IFI<>90THENENDPROC
 1180 IFPOINT(64*(X%+2),1023-32*(Y%+4
))=2 ORPOINT(64*(X%+3),1023-32*(Y%+3)
)=2 ORPOINT(64*(X%+1),1023-32*(Y%+4))
=2 THENPROCBANG1(X%+2,Y%-1):ENDPROC
 1190 ENDPROC
 1200 DEFPROCBANG2(XB%,YB%)
 1210 SOUND0,1,5,1
 1220 PRINTTAB(XB%,YB%);CHR$32;:VDU10
,127,10,9,127,10,9,9,127
 1230 PROCSTART
 1240 ENDPROC
 1250 DEFPROCBBANG
 1260 SOUND0,1,5,1
 1270 IFC%=0 THENPRINTTAB(X%+1,Y%);CH
R$127;:VDU10,9,127,10,9,127,10,9,9,12
7
 1280 IFC%=1THENPRINTTAB(X%+2,Y%);CHR
$127;:VDU127,10,9,9,127,127,10,9,9,12
7,10,9,127
 1290 IFC%=2THENPRINTTAB(X%+2,Y%);CHR
$127;:VDU10,9,127,10,9,127,10,9,127
 1300 IFC%=3THENPRINTTAB(X%+3,Y%);CHR
$127;:VDU127,10,9,9,127,127,10,9,127,
10,9,127
 1310 IFC%=4 THENPRINTTAB(X%+3,Y%);CH
R$127;:VDU10,9,127,10,9,127,10,127
 1320 COLOUR0:X%=1:Y%=24:COLOUR1:PROC
START
 1330 ENDPROC
 1340 DEFPROCBANG1(XA%,YA%)
 1350 SOUND0,1,5,1
 1360 PRINTTAB(XA%,YA%);CHR$32;:VDU10
,127,10,9,127,10,127
 1370 PROCSTART
 1380 ENDPROC
 1390 DEFPROCMOVECHECK2
 1400 IFI<>136THENGOTO1430
 1410 IFPOINT(64*(X%+.5),1023-32*Y%)=
2 ORPOINT(64*(X%+.5),1023-32*(Y%+2))=
2 ORPOINT(64*(X%+1.5),1023-32*(Y%+4))
=2 THENPROCBANG2(X%+1,Y%):ENDPROC
 1420 IFX%=2ANDY%<BANDPOINT(64*(X%-.5
),1023-32*Y%)=2 THENPROCBANG2(X%+1,Y%
)
 1430 IFI<>137THENGOTO1450
 1440 IFPOINT(64*(X%+1),1023-32*Y%)=2
 ORPOINT(64*(X%+2),1023-32*(Y%+3))=2
ORPOINT(64*(X%+1),1023-32*(Y%+2))=2 O
RPOINT(64*(X%+2),1023-32*(Y%+4))=2 OR
POINT(64*(X%+1),1023-32*(Y%+1))=2 THE
NPROCBANG2(X%-1,Y%):ENDPROC
 1450 IFI<>65THENGOTO1470
 1460 IFPOINT(64*X%,1023-32*Y%)=2 ORP
OINT(64*(X%+1),1023-32*Y%)=2 ORPOINT(
64*(X%+2),1023-32*(Y%+3))=2 THENPROCB
ANG2(X%,Y%+1):ENDPROC
 1470 IFI<>90THENENDPROC
 1480 IFPOINT(64*X%,1023-32*(Y%+3))=2
 ORPOINT(64*(X%+1),1023-32*(Y%+4))=2
ORPOINT(64*(X%+2),1023-32*(Y%+4))=2 T
HENPROCBANG2(X%,Y%-1):ENDPROC
 1490 ENDPROC
 1500 DEFPROCGOAL
 1510 LOCALX,Y
 1520 RESTORE1540
 1530 FORP=1TO10:READX,Y:SOUND1,-15,X
,Y:NEXTP
 1540 DATA81,5,89,5,97,5,101,10,81,10
,101,5,97,5,101,5,109,10,89,10
 1550 FORW=0TO5
 1560 COLOUR1:PRINTTAB(15,7);"GOAL";
 1570 FORF=0TO300:NEXT
 1580 COLOUR0:PRINTTAB(15,7);"    ";
 1590 FORF=0TO300:NEXT
 1600 NEXTW
 1610 COLOUR1
 1620 IFTIME<3000THENBON%=1000*LEV%:P
RINTTAB(11,23);"YOU WERE";TAB(10,24);
"VERY FAST";TAB(11,25);"BONUS";TAB(12
,26);"=";BON%;:LIV%=LIV%+1
 1630 IFTIME<6000ANDTIME>=3000THENBON
%=500*LEV%:PRINTTAB(11,23);"YOU WERE"
;TAB(12,24);"FAST";TAB(12,25);"BONUS"
;TAB(12,26);"=";BON%;:LIV%=LIV%+1
 1640 IFTIME>=6000THENBON%=0:PRINTTAB
(11,23);"YOU WERE";TAB(11,24);"TOO SL
OW";TAB(11,25);"BONUS=";BON%;:LIV%=LI
V%+1
 1650 S%=S%+BON%:PRINTTAB(7,29);S%;:I
FM%=5THENLEV%=LEV%+1:IFLEV%>4THENLEV%
=4
 1660 FORF=0TO5000:NEXT:IFM%=5THENCLS
:ENDPROC
 1670 IFM%<5THENPRINTTAB(X%,Y%);CHR$3
2;:VDU10,127,10,9,127,10,9,9,127:PRIN
TTAB(11,23);CHR$32;:VDU32,32,32,32,32
,32,32,10,127,127,127,127,127,127,127
,127,127,10,9,32,32,32,32,32,32,32,32
,10,127,127,127,127,127,127,127:PROCS
TART
 1680 DATA69,5,69,5,77,5,77,5,81,5,81
,5,89,10,97,10,97,5,97,15,97,5,101,5,
97,10,89,5,89,5,81,5,81,5,77,10,69,10

 1690 ENDPROC
 1700 DEFPROCFACE2(XF2%,YF2%)
 1710 COLOUR3
 1720 PRINTTAB(XF2%,YF2%);CHR$248;:VD
U32,10,127,8,249,10,8,250,10,8,251,10
,8,252
 1730 COLOUR1
 1740 ENDPROC
 1750 DEFPROCBLOW1(A1%,B1%)
 1760 SOUND0,2,4,10
 1770 COLOUR1:PRINTTAB(A1%,B1%);CHR$2
47;
 1780 FORF=1TO300:NEXT:PRINTTAB(A1%,B
1%);CHR$32;
 1790 W%=X%
 1800 IFPOINT(64*W%,1023-32*Y%)=2 ORP
OINT(64*W%,1023-32*(Y%+2))=2 ORPOINT(
64*(W%+1),1023-32*(Y%+4))=2 ORPOINT(6
4*W%,1023-32*(Y%+3))=2 THENPROCBANG2(
```

→

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# Escape the Goulogs listing

*From Page 183*

```
W%+1,Y%):ENDPROC
 1810 PRINTTAB(W%,Y%);CHR$228;:VDU10,
8,229,10,8,230,10,231
 1820 PRINTTAB(W%+1,Y%);CHR$32;:VDU32
,10,127,127,10,32,32,10,127
 1830 W%=W%-1
 1840 IFW%=X%-3-Q*LEV% ORINKEY(-122)
THENB%=0:X%=W%+1:ENDPROC
 1850 GOTO1800
 1860 ENDPROC
 1870 DEFPROCFACE1(XF1%,YF1%)
 1880 COLOUR3
 1890 PRINTTAB(XF1%,YF1%);CHR$242;:VD
U10,8,243,10,8,244,10,8,245,10,8,246
 1900 COLOUR1
 1910 ENDPROC
 1920 DEFPROCBLOW2(A2%,B2%)
 1930 SOUND0,2,4,10
 1940 COLOUR1:PRINTTAB(A2%,B2%);CHR$2
53;
 1950 FORF=1TO300:NEXT:PRINTTAB(A2%,B
2%);CHR$32;
 1960 W%=X%
 1970 IFPOINT(64*(W%+3),1023-32*Y%)=2
 ORPOINT(64*(W%+3),1023-32*(Y%+2))=2
ORPOINT(64*(W%+3),1023-32*(Y%+3))=2 O
RPOINT(64*(W%+2),1023-32*(Y%+4))=2 TH
ENPROCBANG1(W%+1,Y%):ENDPROC
 1980 PRINTTAB(W%+2,Y%);CHR$228;:VDU1
0,8,229,10,8,238,10,8,8,239
 1990 PRINTTAB(W%,Y%);CHR$32;:VDU32,1
0,127,127,10,32,32,10,8,127
 2000 W%=W%+1
 2010 IFW%=X%+3+Q*LEV% ORINKEY(-26) T
HENB%=4:X%=W%-1:ENDPROC
 2020 GOTO1970
 2030 ENDPROC
 2040 DEFPROCLIVES
 2050 LIV%=LIV%-1
 2060 PRINTTAB(13+LIV%,29);CHR$32;:VD
U10,127
 2070 ENDPROC
 2080 DEFPROCMOVER1
 2090 I$=INKEY$(0):I=ASC(I$)
 2100 IFI=136THENX%=X%-1 ELSEGOTO2200
 2110 IFX%>2ANDX%<9ANDY%<6THENS%=S%-5
*LEV%
 2120 IFX%>9ANDX%<16ANDY%>22THENS%=S%
-5*LEV%
 2130 SOUND1,-15,100,1
 2140 PROCMOVECHECK1
 2150 PRINTTAB(X%+3,Y%);CHR$32;:VDU10
,127,10,9,127,10,127
 2160 PRINTTAB(7,29);S%;TAB(X%+2,Y%);
CHR$228;:VDU10,8,229,10,8,238,10,8,8,
239
 2170 Z%=0
 2180 PROCDEL
 2190 IFINKEY(-26)THENGOTO2100
 2200 IFI=137THENX%=X%+1 ELSEGOTO2310
 2210 IFY%>17ANDY%<25ANDX%>16THENX%=1
6:ENDPROC
 2220 IFX%>3ANDX%<10ANDY%<6THENS%=S%+
5*LEV%
 2230 IFX%>10ANDX%<17ANDY%>22THENS%=S
%+5*LEV%
 2240 SOUND1,-15,100,1
 2250 PROCMOVECHECK1
 2260 PRINTTAB(X%+1,Y%);CHR$32;:VDU10
,127,10,9,127,10,127
 2270 PRINTTAB(7,29);S%;TAB(X%+2,Y%);
CHR$228;:VDU10,8,229,10,8,238,10,8,8,
239
 2280 Z%=0
 2290 PROCDEL
 2300 IFINKEY(-122)THENGOTO2200
 2310 IFI=65THENY%=Y%-1 ELSEGOTO2460
 2320 IFY%<1THENY%=1
 2330 IFX%>0ANDX%<6ANDY%>4THENS%=S%+5
*LEV%
 2340 IFX%>14ANDX%<19ANDY%<23ANDY%>1T
HENS%=S%+5*LEV%
 2350 IFX%>7ANDX%<14ANDY%<24ANDY%>2TH
ENS%=S%-5*LEV%
 2360 SOUND1,-15,100,1
 2370 PROCMOVECHECK1
 2380 PRINTTAB(X%+1,Y%+4);CHR$32;:VDU
11,32
 2390 PRINTTAB(7,29);S%;TAB(X%+2,Y%);
CHR$228;:VDU10,8,229,10,8,238,10,8,8,
239
 2400 Z%=0
 2410 IFLEV%>2ANDX%<3+LEV%ANDX%>2ANDY
%=5 THENPROCBLOWCHECK2(3,6)
 2420 IFX%>9-LEV%ANDX%<10ANDY%=5THENP
ROCBLOWCHECK1PLUS(11,6)
 2430 IFX%>16-LEV%ANDX%<17ANDY%=23THE
NPROCBLOWCHECK1PLUS(18,24)
 2440 PROCDEL
 2450 IFINKEY(-66)THENGOTO2310
 2460 IFI=90THENY%=Y%+1 ELSEENDPROC:I
FY%>27THENY%=27
 2470 IFY%>24THENY%=24
 2480 IFX%>0ANDX%<6ANDY%>3THENS%=S%-5
*LEV%
 2490 IFX%>14ANDX%<19THENS%=S%-5*LEV%

 2500 IFX%>8ANDX%<14ANDY%<24ANDY%>5TH
ENS%=S%+5*LEV%
 2510 SOUND1,-15,100,1
 2520 PROCMOVECHECK1
 2530 PRINTTAB(X%+2,Y%-1);CHR$32;:VDU
10,10,10,8,127
 2540 PRINTTAB(7,29);S%;TAB(X%+2,Y%);
CHR$228;:VDU10,8,229,10,8,238,10,8,8,
239
 2550 Z%=0
 2560 IFLEV%>2ANDX%<3+LEV%ANDX%>2ANDY
%=5 THENPROCBLOWCHECK2(3,6)
 2570 IFX%>9-LEV%ANDX%<10ANDY%=5THENP
ROCBLOWCHECK1PLUS(11,6)
 2580 IFX%>16-LEV%ANDX%<17ANDY%=23THE
NPROCBLOWCHECK1PLUS(18,24)
 2590 PROCDEL
 2600 IFINKEY(-98)THENGOTO2460
 2610 ENDPROC
 2620 DEFPROCMOVER2
 2630 I$=INKEY$(0):I=ASC(I$)
 2640 IFI=136THENX%=X%-1 ELSEGOTO2740
 2650 IFX%>2ANDX%<9ANDY%<6THENS%=S%-5
*LEV%
 2660 IFX%>9ANDX%<16ANDY%>22THENS%=S%
-5*LEV%
 2670 SOUND1,-15,100,1
 2680 PROCMOVECHECK2
 2690 PRINTTAB(X%+1,Y%);CHR$32;:VDU10
,127,10,9,127,10,9,9,127
 2700 PRINTTAB(7,29);S%;TAB(X%,Y%);CH
R$228;:VDU10,8,229,10,8,230,10,231
 2710 Z%=0
 2720 PROCDEL
 2730 IFINKEY(-26)THENGOTO2640
 2740 IFI=137THENX%=X%+1 ELSEGOTO2850
 2750 IFY%>17ANDY%<25ANDX%>16THENX%=1
6:ENDPROC
 2760 IFX%>3ANDX%<10ANDY%<6THENS%=S%+
5*LEV%
 2770 IFX%>10ANDX%<17ANDY%>22THENS%=S
%+5*LEV%
 2780 SOUND1,-15,100,1
 2790 PROCMOVECHECK2
 2800 PRINTTAB(X%-1,Y%);CHR$32;:VDU10
,127,10,9,127,10,9,9,127
 2810 PRINTTAB(7,29);S%;TAB(X%,Y%);CH
R$228;:VDU10,8,229,10,8,230,10,231
 2820 Z%=0
 2830 PROCDEL
```

→

# Escape the Goulogs listing

*From Page 185*

```
 2840 IFINKEY(-122)THENGOTO2740
 2850 IFI=65THENY%=Y%-1 ELSEGOTO3000
 2860 IFY%<1THENY%=1
 2870 IFX%>0ANDX%<6ANDY%>4THENS%=S%+5
*LEV%
 2880 IFX%>14ANDX%<19ANDY%<23ANDY%>1T
HENS%=S%+5*LEV%
 2890 IFX%>7ANDX%<14ANDY%>2ANDY%<24TH
ENS%=S%-5*LEV%
 2900 SOUND1,-15,100,1
 2910 PROCMOVECHECK2
 2920 PRINTTAB(X%,Y%+3);CHR$32;:VDU10
,32
 2930 PRINTTAB(7,29);S%;TAB(X%,Y%);CH
R$228;:VDU10,8,229,10,8,230,10,231
 2940 Z%=0
 2950 IFX%>9-LEV%ANDX%<10ANDY%=5THENP
ROCBLOWCHECK1(11,6)
 2960 IFX%>16-LEV%ANDX%<17ANDY%=23THE
NPROCBLOWCHECK1(18,24)
 2970 IFLEV%>2ANDX%<3+LEV%ANDX%>2ANDY
%=5THENPROCBLOWCHECK2PLUS(3,6)
 2980 PROCDEL
 2990 IFINKEY(-66)THENGOTO2850
 3000 IFI=90THENY%=Y%+1 ELSEENDPROC
 3010 IFX%>8ANDX%<14ANDY%>5ANDY%<24TH
ENS%=S%+5*LEV%
 3020 IFX%>0ANDX%<6ANDY%>3THENS%=S%-5
*LEV%
 3030 IFX%>14ANDX%<19THENS%=S%-5*LEV%
 3040 SOUND1,-15,100,1
 3050 PROCMOVECHECK2
 3060 PRINTTAB(X%,Y%-1);CHR$32;:VDU10
,10,10,32
 3070 PRINTTAB(7,29);S%;TAB(X%,Y%);CH
R$228;:VDU10,8,229,10,8,230,10,231
 3080 Z%=0
 3090 IFX%>16-LEV%ANDX%<17ANDY%=23THE
NPROCBLOWCHECK1(18,24)
 3100 IFLEV%>2ANDX%<3+LEV%ANDX%>2ANDY
%=5THENPROCBLOWCHECK2PLUS(3,6)
 3110 IFX%>9-LEV%ANDX%<10ANDY%=5THENP
ROCBLOWCHECK1(11,6)
 3120 PROCDEL
 3130 IFINKEY(-98)THENGOTO3000
 3140 ENDPROC
 3150 DEFPROCDEL
 3160 FORA=0TO200-66*(LEV%-1):NEXT
 3170 ENDPROC
 3180 DEFPROCSTART
 3190 PRINTTAB(1,29);"SCORE=     ";TA
B(7,29);S%;TAB(1,30);"LEVEL=     ";TA
B(7,30);LEV%;TAB(13,29);CHR$32;:VDU32
,32,32,32,32,10,127,127,127,127,127,1
27
 3200 IFLIV%=0THENPROCEND
 3210 FORV=0TOLIV%-1:PRINTTAB(13+V,29
);CHR$240;:VDU10,8,241:NEXTV
 3220 REPEAT:UNTILGET=32:Z%=0:X%=2:Y%
=23
 3230 TIME=0
 3240 PROCLIVES
 3250 ENDPROC
 3260 DEFPROCINST
 3270 LEV%=0
 3280 PRINT'''''''"DO YOU WANT INSTRU
CTIONS?"
 3290 IF GET$<>"Y"THENGOTO3390
 3300 PRINT''" The aim of the game is
 to guide the"'"balloon round the cou
rse and score a"'"goal by arriving at
 the far end. You"'"can choose your l
evel(1-4) or have"'"a progressive inc
rease in level(5)"
 3310 PRINT"every time you score a go
al. A bonus"'"is scored depending on
your speed,"'"and you gain an extra l
ife for"'"each goal scored."
 3320 PRINT" The balloon MUST be kept
 moving."'"If it is left in the same
place for"'"too long, it will burst.
If the"'"balloon or the string touch
the"'"sides of the course it will als
o"'"burst."
 3330 PRINT" Press the 'SPACE' bar to
 re-start"'"play at each level and af
ter bursting"'"a balloon."
 3340 PRINT'''"PRESS 'SPACE' TO CONTI
NUE"
 3350 REPEAT:UNTILGET=32
 3360 CLS
 3370 PRINT'''"'A'------moves the ba
lloon UP"'''"'Z'------moves the ballo
on DOWN"'''"'"CHR$219;"'------moves t
he balloon LEFT"'''"'"CHR$221;"'-----
-moves the balloon RIGHT"'''''"   PRE
SS 'SPACE TO CONTINUE"
 3380 REPEAT:UNTILGET=32
 3390 CLS:INPUT''''''''''''"CHOOSE YO
UR LEVEL"'"(1-4,PROGRESSIVE=5)"M%
 3400 IFM%>5THENM%=5
 3410 IFM%<5THENLEV%=M%
 3420 IFM%=5THENLEV%=1
 3430 ENDPROC
 3440 DEFPROCEND
 3450 IFM%=1ANDHI1%<S%THENHI1%=S%:PRO
CFANFARE:COLOUR2
 3460 IFM%=2ANDHI2%<S%THENHI2%=S%:PRO
CFANFARE:COLOUR2
 3470 IFM%=3ANDHI3%<S%THENHI3%=S%:PRO
CFANFARE:COLOUR2
 3480 IFM%=4ANDHI4%<S%THENHI4%=S%:PRO
CFANFARE:COLOUR2
 3490 IFM%=5ANDHI5%<S%THENHI5%=S%:PRO
CFANFARE:COLOUR2
 3500 FORD=0TO5000:NEXT
 3510 CLS:PRINT'''"YOUR SCORE=";S%;
 3520 COLOUR1:PRINT''"HI-SCORES"''"Le
vel1.......";HI1%;''"Level2.......";H
I2%;''"Level3.......";HI3%;''"Level4.
......";HI4%;''"Prog.........";HI5%;'
''"Do you want"'"another game?"''"PRE
SS'Y'"
 3530 REPEAT:UNTIL GET=89:GOTO90
 3540 ENDPROC
 3550 DEFPROCBLOWCHECK1PLUS(J%,K%)
 3560 LOCALP,Q
 3570 P=RND(10):Q=RND(4)
 3580 IFP>4+LEV%THENENDPROC
 3590 PROCBLOW1(J%,K%)
 3600 FORB%=0TO4
 3610 FORF=0TO200-33*(LEV%-1):NEXT
 3620 PROCBAL1
 3630 PROCSTR1
 3640 NEXTB%
 3650 ENDPROC
 3660 DEFPROCBLOWCHECK2PLUS(J%,K%)
 3670 LOCALP,Q
 3680 P=RND(10):Q=RND(4)
 3690 IFP>4+LEV% THENENDPROC
 3700 PROCBLOW2(J%,K%)
 3710 FORB%=4TO0 STEP-1
 3720 FORF=0TO200-33*(LEV%-1):NEXT
 3730 PROCBAL2
 3740 PROCSTR2
 3750 NEXTB%
 3760 ENDPROC
 3770 DEFPROCBLOWCHECK1(J%,K%)
 3780 LOCALP,Q
 3790 P=RND(10):Q=RND(4)
 3800 IFP>4+LEV% THENENDPROC
 3810 PROCBLOW1(J%,K%)
 3820 ENDPROC
 3830 DEFPROCBLOWCHECK2(J%,K%)
 3840 LOCALP,Q
 3850 P=RND(10):Q=RND(4)
 3860 IFP>4+LEV% THENENDPROC
 3870 PROCBLOW2(J%,K%)
 3880 ENDPROC
 3890 DEFPROCFANFARE
 3900 LOCALX,Y
 3910 RESTORE3940
 3920 FORN=1TO20:READX,Y
 3930 SOUND2,-15,X,Y:NEXT:ENDPROC
 3940 DATA53,5,69,5,81,6,89,3,81,5,69
,5,53,5,69,5,81,6,89,3,81,5,69,5,53,5
,69,5,81,15,89,15,73,6,69,3,73,5,61,1
0
 3950 ENDPROC
```

***This listing is included in this month's cassette tape offer. See order form on Page 217.***

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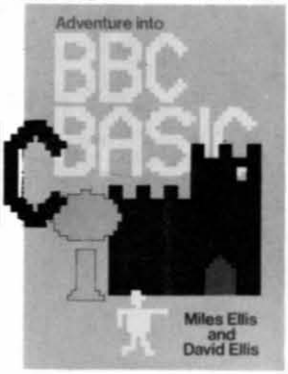

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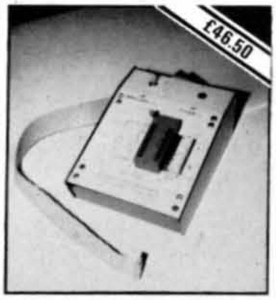

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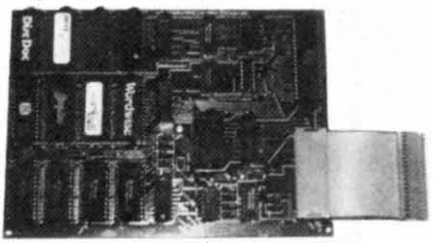

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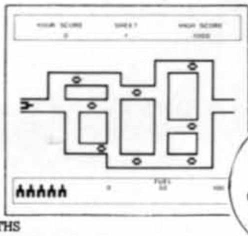

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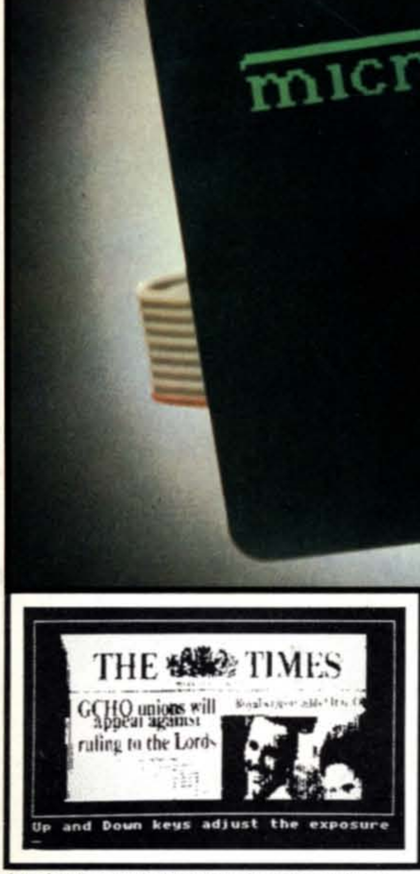
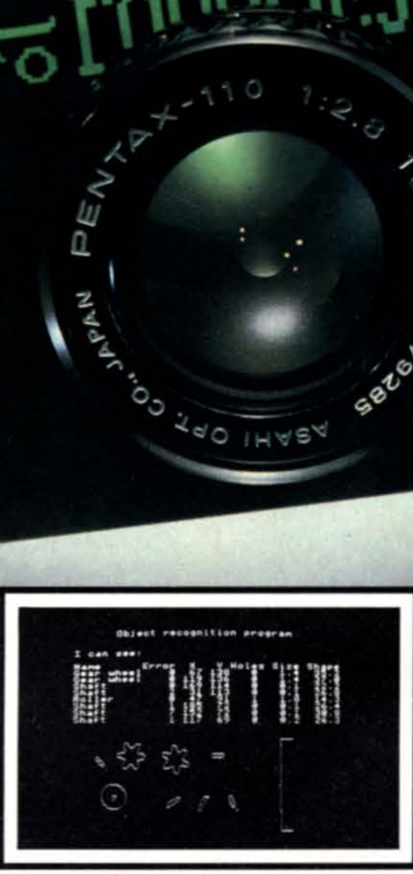


THE TIMES

GCHQ unions will appeal against ruling to the Lords

Up and Down keys adjust the exposure

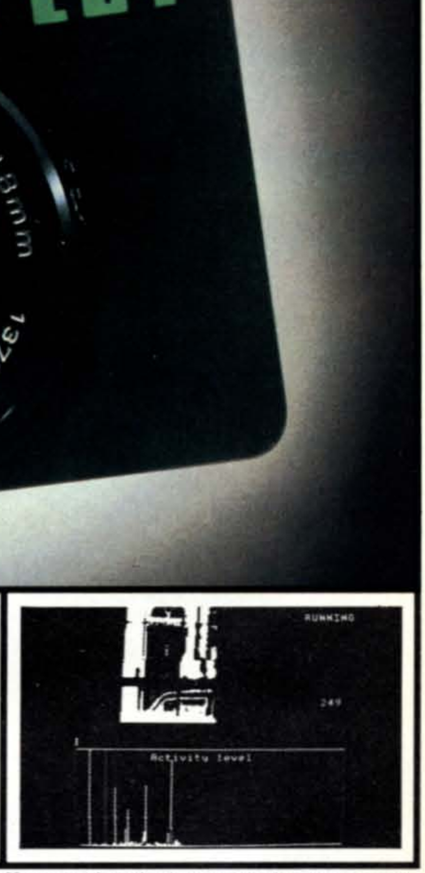
**Imaging** A program that takes pictures for printing, storage and transmission. A second version of the program can be used to record a short animation sequence.



Object recognition program

I can see:

**Object recognition** A powerful program for analysing a scene containing multiple non-overlapping parts. Area, perimeter, centre of gravity, are calculated in a split second.



RUNNING

249

Activity level

**Movement detection** A program that analyses any movement in a scene which for example could be used to count the number of people moving down a street or ring an alarm if anything moves.

There's no need to keep your home computer in the dark a minute longer. The Micro-Robotics EV1 is a revolutionary new electronic camera that can be connected to your computer to give it the power of sight. It has applications in the fields of security, in industrial object recognition, graphic design, robotics and Artificial Intelligence. For the first time it is possible to capture black-and-white and grey scale pictures on a microcomputer without the use of an expensive external video camera. Full documentation and a comprehensive library of useful software are provided with each system, all for **only £129.95** (inc. VAT).

**Dealer enquiries welcome.**

**Technical Specification**
Resolution 246 x 128  Size 70 x 50 x 55 mm
Capture Time 64mSec Interface Userport
Weight 75 grms

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# MICROMAIL

## Background to that Mode 7 colour scene

*HOW can you fill the background with any one colour in Mode 7? In other words, what is the equivalent of the following for Mode 7:*

```
10 MODE2
20 GCOL0,129:CLG
```

*I'm sure there must be an easy answer, but I can't find it anywhere.* – **M. Wyatt, Gravesend, Kent.**

● To fill a line with one background colour, you simply place the CHR$ number of the colour you want in the left hand byte (CHR$131 for yellow) of the line with CHR$ 157 next to it. The latter tells the micro that the first CHR$ refers to the background colour.

The easiest way to do this is to print them in the correct positions with Tab using a loop so that the whole screen is filled line by line. This can be a bit tedious though.

Alternatively you can poke the required bytes onto the screen, as in this listing:

```
  10 CLS
  20 FOR L%=&7C00 TO &7FFF
STEP 40: ?L%=131:L%?1=157:
NEXT L%
  30 A$=GET$
```

Line 10 is necessary to avoid any scrolling affecting the screen memory locations adversely. The screen then starts at &7C00, and the step 40 moves it down line by line.

The varying values of L% ensure that the code for yellow is poked down the left of the screen, and that for background next to it.

This of course is the unforgiveable crime against Acorn – directly addressing the screen. So it won't work over the tube!

You must remember that the two leftmost characters of each line are being used. Sticking another character on top of either will undo your hard work.

That's why we used line 30 to stop the prompt sign appearing at the top of the screen and spoiling my first line. Leave it out and see!

## Monitor bug hunt

*I WAS interested to read the letter by P. Stanesby in your July issue about the Break "bug" in the Monitor listing.*

*Like your correspondent I spent considerable time typing both the listing for the Monitor and also the "toolkit".*

*Unfortunately I could get neither of these to work satisfactorily and in sheer desperation sent for the tape only to find that the problems which I had encountered were still present.*

*In the case of the "toolkit" I still have a peculiar fault in that although formatting is effective for any number of tracks, the catalogue listing of the formatted blank always shows option (9) with (9) in colour and sometimes flashing.*

*The Monitor program is much more troublesome. Like your correspondent, I found that the S, T and R commands caused a return to Basic, and changing the entry points to those in your correspondent's letter provided only a partial solution.*

*With these, I cannot get the Z function to operate. Step and trace commands work after a fashion.*

*I might add that the Monitor disassembles correctly and the M and L commands are satisfactory although with long listings occasional returns to menu occur.*

*Perhaps you may be able to offer some advice. The set up which I have is Basic II with O.S. 1.2 and DFS .98?* – **F.W. Adams, Sheffield.**

● You are correct in saying the trace command will not work when tracing through ROM. However, all of the other commands have been tested and all work correctly.

One source of error could be the misprint in the letter by **P.** Stanesby. This should have read:

'Change JMP&8AE1 to JMP&8B38', not just JSR as printed.

I hope this is useful.

## Wordwise safeguard

*I HAVE tried Marcus Adams' program to safeguard accidental overwriting of files, which appeared in the July edition of the Micro User, on my BBC Model B.*

*This program works a treat but it was a disappointment to me that it did not work with Wordwise. Is there any way to adapt it to do so?*

*When using Wordwise it is very easy to lose a document when loading. For example, if key f1 is pressed instead of key f2 a blank document is saved which is then given the file name of the document one was attempting to load.*

*The result is the complete loss of the document.*

*A protect utility would be invaluable here.* – **R.G. Loveday. Woking, Surrey.**

● Your wish is our command. We'll be publishing a utility to help you out with your problems in the near future.

## Taking the wrong line

*AFTER my last letter to you on the subject of the LINE command you sent me an extract from your magazine of August 1983. This covers the *LINE command, and I read it with interest at the time of publication.*

*The LINE command that I was enquiring about, however, is a Basic command and not an operating system one, that is a Basic token which is listable as "LINE".*

*The token has value &86 and is given in the User Guide on page 484 in the section on minimum abbreviations.*

*Insertion of this token into Basic text does list as "LINE" but the use of the command in various syntax forms standard to both BBC and Microsoft Basic return a variety of errors, primarily "Mistake" and "Syntax error".*

*Since this is obviously a Basic command or standard variable – like COUNT,TOP etc – and not documented in any other section of the manual, could you please shed some light on its uses, if any.* – **T.C. Thomas, Guildford, Surrey.**

● Sorry, we should have known our readers better than that. The LINE you're referring to is the latter half of Basic's INPUT LINE.

# MICROMAIL

## Shapes on show

*THE following addition to Teditor (August issue of The Micro User) causes the micro to display all the graphic shapes in turn with the appropriate keyboard symbol.*

*The routine is called by pressing the Esc key and then G (Graphic) as a command, when the full block (255) is displayed on the bottom line of the screen.*

*Pressing < or > causes the graphic character number to be increased or decreased and the appropriate shape and character displayed, so it is very easy to search for an appropriate shape.*

*Pressing the space bar returns to the main program.*

*Amend the printed program as follows. Where possible I have made the amendment the first item of any line.*

```
  920 PRINT "Command (G,L,S
,C,I,D,W,B,E,M,?)";
  930 G%=INST("GgEeSsLl?/Bb
CcWwIiDdMm", GET$):G%=(G%+1
)DIV 2
  950 ON G% GOTO 955,1080,9
60,970,980,990,1000,1010,10
20,1030,1040 ELSE 920
  955 PROCclear:PROCgraphle
t:GOTO1050
 1685 PRINT "G..Graphic Sea
rch"
```

*Add the following PROC:*

```
 2500 DEFPROCgraphlet
 2510 GL=255
 2520 PRINTTAB(3,24)"Graphi
c  ";CHR$(1   51); CHR$(GL)
;CHR$(135); " = ";CHR$(G
L);
 2530 g=GET:IF g=60 OR g=44
 THEN GL=GL-1:IF GL=223 THE
N GL=191 ELSE IF GL=160 THE
N GL=255
 2540 IF g=62 OR g=46 THEN
GL=GL+1:IF GL =256 THEN GL=
161 ELSE IF GL=192 THEN GL=
224
 2550 IF g=32 THEN g=255:EN
DPROC
 2560 GOTO 2520
```

*The line amendments and additions simply add the command G to the help page and the command line and direct it to PROCgraphlet.*

*In PROCgraphlet the graphic is first set to 255 and then displayed as a graphic and as the keyboard character in lines 2510 and 2520.*

*The next two lines add or subtract 1 from the character, but skip over the letters etc which have no equivalent graphic when < or > are pressed.*

*The last line returns to the main program when the space bar is pressed.*

*This has proved far more convenient than repeatedly looking up the manual to find the necessary characters.* – **B.L. Hensman, Keighley, W. Yorks.**

## DEALING WITH DIGITS

*IN "Scientific America" Fred Druenberger, Professor of Computer Science at California State University, writes an article on how to handle thousands of digits.*

*The example he takes is the square of the number 1.0000001 to the 134217728th power. He performed this calculation on several machines (not the Beeb).*

*The correct result to 10 significant figures is 674530.4707.*

*On his trials the Apple II Basic gave 22723.9709, an error of 96.63114 per cent.*

*IBM PC Basic gave 8850273, an error of 1212.06425 per cent.*

*The TRS 80 machine gave 8886690, an error of 1217.4640 per cent. The BBC Basic gave an answer of – 685090.513, an error of 1.56553969 per cent.*

*What do we conclude about the rounding tactics used in BBC Basic? Not bad, eh?* – **J. Joyce, New Zealand.**

## Beastie's forte

*I THINK it important to clarify some points regarding "Beasty" and its use in films (August issue of The Micro User).*

*Servo motors are commonly used in special effects departments throughout the film industry for the control of the movement in robotic models.*

*Although the servos used could be controlled by the "Beasty" due to the complexity of the models, professional radio controlled equipment is used in its place.*

*The "Beasty" is more suited to the beginner in robotics who wishes to utilise computer control.* – **Timothy Coote, Commotion, Enfield.**

## Backgamon for two

*CONGRATULATIONS on a great program – Backgammon (Micro User, July 1984).*

*There is just one thing missing, and that is an alternative for two players.*

*I'm sure many of your readers would appreciate an addition to the program.*

*How about it?* – **W.J. Russell, Maidstone, Kent.**

● Can any of our talented readers rise to the challenge? Six to four on you do!

## Doomrun mod

*THANKS for the excellent magazine, particularly the July 1984 issue with the listing of "Doomrun" – a superb program.*

*May I offer a modification that may interest my fellow readers – it adds a hi-score to the game.*

*It can be quite useful as your friend can't argue when you beat him!*

*Firstly, we must create some space for our extra lines, so delete lines 1750 to 1850 as PROCsp and PROC3sp appear identical.*

*Now change PROC3sp in lines 630 and 660 to PROCsp. That done, now add the following three lines:*

```
  90 R%=0
 355 VDU20

 365 IF H%>R% R%=H%:COLOUR
14:PRINTTAB(2,3)"NEW HI-SCO
RE= ";R% ELSE COLOUR14:PRIN
TTAB(4,3)"HI-SCORE= ";R%
```

*I hope this will be of some use to my fellow readers.* – **N.D. Blount, Fallings Park, Wolverhampton.**

## Keyword tokens

*HERE is a little tip which might prove interesting.*

*If a character with an Ascii value of more than &7F is entered into the keyboard buffer the computer recognises it as the token of a Basic keyword.*

*If the function keys are now defined to give values corresponding to these tokens "one touch" entry of keywords can be obtained.*

*The maximum number obtainable is 40 (f-keys, Shift + f keys, Ctrl + f-keys and Shift + Ctrl + f keys).*

*If the following Ascii file is created using *BUILD it can then be *EXECed when needed.*

```
*BUILD KEYS
*FX 225,144
*FX 226,154
*FX 227,164
*FX 228,174
CLS
<Escape>
*EXEC KEYS
```

– **S.P. Barker, Oberammergau, South Germany.**

● *Want to write to Micromail? The address is: Micromail, The Micro User, Europa House, 68 Chester Road, Hazel Grove, Stockport SK7 5NY.*

## Friendly network

*I AM writing to express my satisfaction with the excellent CAD network described in the March 1984 issue of The Micro User.*

*We have used this system for two months and found it to be both cheap to make and simple to use.*

*We have, however, found that since the system is frequently used by non-specialist staff, a more user-friendly version has been valuable.*

*I enclose a listing of this modified version as in use currently at the school. Should any of your readers have further suggestions for improvements or modifications, perhaps they would care to pass this on through these pages.* – **S. Randall, Mathematics Department, St Bedes RC High School, Lytham St Annes.**

```
    1 REM CHEAPNET BY S.RAN
DALL
    2 REM ORIGINAL IDEA BY
TONY CRAVEN (MICRO USER MAR
CH 1984)
  100 *KEY0*FX3,7|ML.|MP."*
FX2,0"|M*FX3,4|M
  110 *KEY1*FX2,1|M
  120 *KEY30.|MRUN|M
  130 *KEY40.|M MODE6|M VDU
19,0,4;0;|M VDU14|M L. |M V
DU15|M
  140 CLS
  150 NF=0
  160 PRINT:PRINT:PRINT:PRI
NT"STATION O.K"
  170 PRINT"============":PR
INT
  180 PRINT:PRINT"f-key0 wi
ll transmit to fileserver"
  190 PRINT"f-key1 will rec
eive from fileserver"
  200 PRINT"f-key3 will run
 the current program"
  210 PRINT"f-key4 will lis
t the current program"
  220 IF NF=1 THEN GOTO 330
  230 PRINT:PRINT"NOW TYPE
NEW AND PRESS <RETURN>":PRINT
  240 *FX2,0
  250 REM ABOVE LINES SENT
TO STATION
  260 *KEY9*FX3,7|ML.100,25
0|MP."RUN"|M*FX3,0|M
  270 REM FILESERVER INSTRU
CTION DISPLAY
  280 CLS
  290 PRINT"NETWORK FILESER
VER O.K."
  300 PRINT"================
=========":PRINT
  310 NF=1
  320 GOTO 180
  330 NF=0
  340 PRINT"f-key9 will set
 up network at a station":P
RINT
  350 PRINT"NEXT STEPS:":PR
INT
  360 PRINT"1) Select stati
on number at fileserver"
  370 PRINT:PRINT"2) At tha
t station;"
  380 PRINT"          a)Press
<BREAK>"
  390 PRINT"          b)Type *
T. and press <RETURN>"
  400 PRINT"          c)Type *
FX2,1 and press <RETURN>"
  410 PRINT:PRINT"3) Back a
t the fileserver, press f9"
  420 PRINT:PRINT"4) Select
 next station, or if all se
t up, type NEW and press <R
ETURN>"
  430 END
```

## DFS mysteries

*I HAVE spent many hours in hopeful anticipation typing in the "Dumper" program in the January 1984 issue of The Micro User "Printing Pixels" by A. Plume.*

*I would greatly appreciate a clear concise explanation of the steps required to assemble, save and run the above program on a BBC Model B with Acorn DFS.*

*In the numerous books I have bought on the BBC Micro, I have yet to see a clear concise explanation on the mysteries of the DFS and its use with assembly language programs.*

*In the above article, the length of the code is said to be 357 bytes, but when I type it in using PRINT TOP-PAGE, after only about six or seven lines (TOP-PAGE) >357. Please advise how 357 was obtained.*

*I believe there is a need for an article in the Micro User that clearly explains the steps of assembling, saving and running assembly language programs on disc, preferably illustrated with several examples.*

*The articles I have seen that contain assembly code have tended to be very brief in their explanation of where and how the code is saved etc.*

*I look forward to one day being able to use the above program on my Epson FX-80 printer. I hope that day is not too far away.* – **A.M. Lang, Zeeham, Tasmania.**

● In your letter you say that TOP-PAGE is greater than 357, when you have only typed in several lines. The reason for this is that TOP-PAGE is the length of the Basic program, not the assembled code.

The length of the code can be found by typing PRINT P%-S%.

The Basic program and the assembled code are totally separate, therefore the length of each must be found using the two methods described above.

## Lantern improved

*AFTER typing in the lantern program in the May 1984 issue of The Micro User, I found that a few alterations improve the effect.*

*Add line:*

```
165 MOVEX%-J%,I%
```

*Change line 170 to:*

```
170 PLOT85,X%-J%,I%
```

*and alter line 140 to go down in steps of –3.*

```
140 FORI%=Y%+R% TO Y%-R%
STEP-3
```

*The Micro User has been much improved by the new design of cover. It now lasts long enough without tearing till the next month's issue.* – **G. Abdullah, Tottenham, London.**

## Olympics timing

*CONGRATULATIONS on your superb game Micro Olympics. I have played it often and have never succeeded in beating the computer at running (or at any of the other events).*

*I have a Microtest Starstick ROM and Quickshot 2 joystick which has an auto fire option.*

*Using this and the keyboard I have achieved a speed of over 60 mph. My achievements are listed below:*

1. *The 1500m in 41 seconds*
2. *The 800m in 25 seconds*
3. *The 400m in 10 seconds*
4. *The 200m in 6 seconds*
5. *The 100m in 3 seconds*

*Can anyone think of any other way to beat these times?* – **B. Sarosi, Abingdon, Oxon.**

## Records

*FIRST of all I would like to thank you for such a good magazine and to thank you for such a great game as "Micro Olympics".*

*For many months, I have looked out for some records by Beeb owners, but so far there has not been any.*

*So here are a few of mine:*

| | |
|---|---|
| *100m* | *8.90 secs** |
| *200m* | *21.54 secs* |
| *Javelin* | *100.36m** |
| *Discus* | *72.04m** |
| *Hammer* | *84.82m** |
| *High Jump* | *2.35m* |

* = *World record.* – **S. Johnson, S. Yorks.**

# MICROMAIL

## Interesting effects . . .

*I WAS just fooling around with sines and cosines when I added a small VDU 19 routine onto the end and I got some interesting effects. So I have written out this listing:*

```
   10REM SPHERE
   20MODE2
   30VDU23;8202;0;0;0;
   40VDU29,640;512;
   50MOVE0,400
   60FOR I=0 TO 360
   70GCOL0,I MOD15+1
   80PLOT69,SIN(RAD(I))*400
,COS(RAD(I))*400
   90PLOT69,SIN(RAD(I))*100
,COS(RAD(I))*400
  100PLOT69,SIN(RAD(I))*400
,COS(RAD(I))*100
  110NEXT
  120FOR I= 0 TO 15
  130VDU19,I,0,0,0,0
  140NEXT
  150REPEAT
  160FOR I=1 TO 15
  170*FX19
  180VDU19,I,7,0,0,0
  190TIME=0
  200REPEATUNTILTIME=10
  210VDU19,I,0,0,0,0
  220NEXT
  230UNTIL0
```

*If this is typed in correctly there should be a sphere of multicoloured dots and after it has finished it should display a few small white dots rotating by themselves.* – **Miles Dymock, Stoke by Clare, Suffolk.**

## Coming clean

*I WAS interested to read Cyril Flanaghan's letter (June 1984) regarding the inclusion of inverted commas in PRINT and INPUT statements.*

*Some time ago I was faced with the problem and tried the same method. However I soon got fed up with checking all the inverted commas to make sure I had the right number.*

*I wanted a better method that would get around statements like: PRINT CHR$34; "Hello";CHR$34;" he said."*

*After a bit of experimentation I found a simple 'clean' method. It only works in Mode 7 though, without re-defining characters.*

*In Mode 7 Ascii codes 161 thru 254, when enclosed by inverted commas, become "+128 wrap-round" versions of Ascii codes 33 thru 126.*

*It is a simple matter then to program one of the user definable keys to produce the Ascii code +128 of the character you wish to duplicate. In this case it's Ascii code 162.*

*A better method probably would be to program the TAB key using *FX219. So far I haven't been able to do that and produce Ascii code 162. Most others, but not the one I want. Maybe someone else out there knows.*

*Anyway, for those that are interested, here it is:*

```
OS 0.1......*KEY0 ‼'‼"
<CR>
OS 1.0+.....*FX255,162
(or *FX226/7/8) <CR>
```

*Then type in and RUN . . .*

```
10 PRINT"+Hello, Fred+,
quoth he."
```

*not forgetting to press user definable key 0 where marked +.* – **Jim Stretch, Bournemouth.**

## These are the jokes, folks!

*I ALWAYS read you excellent Micro User. I think you should have a jokes section.*

*Here are some jokes:*

*Riddle: How did Mario get Killer Gorilla at the bottom of the screen?*

*Answer: Show him a banana.*

*What happens when you plug in a faulty Electron?*

*You get electricuted.*

*Please print this letter so the readers can send in jokes. If you*

# Helpful terminal software

*MANY thanks for introducing the Microweb Bulletin Board and the very best of luck for the future with it.*

*I thought that readers who already own suitable modems might be interested in the terminal software that I have used successfully on other boards.*

*As you can see, after removing the explanatory lines from the listing, the necessary code for communicating takes up only half a dozen lines or so and is very simple to understand and operate.*

*As many readers will know, locations &FE08 and &FE09 monitor the RS423 port.*

*Perhaps in a future article you might give some tips on downloading software. I'm afraid that I am a little baffled at present having failed twice to download into my Beeb's memory.*

*The printer option however, enabled me to take a listing of one of your first offerings.* – **Don Salt, Leicester.**

```
   10 REM TERMINAL SOFTWARE
   20 REM FOR 300 BAUD BULL
ETIN BOARDS
   30 REM INCLUDING 'MICROW
EB'
   40 REM DISABLE FORM FEED
 ON PRINTER
   50 *FX6,12
   60 REM DISABLE ESCAPE KE
Y
   70 *FX220,0
   80 REM SET BAUD RATES
   90 *FX7,3
  100 *FX8,3
  110 ON ERROR VDU3:MODE7:E
ND
  120 MODE7:VDU23;8202;0;0;
0;
  130 PRINT''CHR$141 CHR$13
1" BBC MICRO TERMINAL "
  140 PRINT CHR$141 CHR$131
" BBC MICRO TERMINAL "
  150 PRINT''''TAB(10)CHR$1
41 CHR$130"300 BAUD WORKING
"
  160 PRINT TAB(10) CHR$141
 CHR$130"300 BAUD WORKING"
  170 PRINT'''CHR$141 CHR$1
34"  1.  Enable parallel pr
inter dump"
  180 PRINT CHR$141 CHR$134
"  1.  Enable parallel prin
ter dump"
  190 PRINT
  200 PRINT CHR$141 CHR$134
"  2.  Disable printer"
  210 PRINT CHR$141 CHR$134
"  2.  Disable printer"
  220 PRINT''''TAB(8)CHR$14
1"Press appropriate key....
.."
  230 PRINT TAB(8)CHR$141"P
ress appropriate key......"
  240 REPEAT:choice%=GET:UN
TIL choice%=49 OR choice%=5
0
  250 IF choice%=49 THEN CL
S:PRINTTAB(5) "DIAL NOW":VD
U2:ELSE CLS:PRINTTAB(5)"DIA
L NOW"
  260 wait = INKEY(1500):CL
S:REM delay during dialling
  270 VDU23;10;0;0;0;:REM s
teady block cursor
  280 REM NOW FOR THE MAIN
LOOP
  290 REM THAT ALLOWS US TO
 COMMUNICATE
  300 REPEAT
  310   IF (?&FE08 AND 1) =
 1 PRINTCHR$ (?&FE09 AND 12
7);
  320   a$=inkey$(0):IF a$<
>"" ?FE09=ASCa$
  330 UNTIL0
```

*do not like my idea, please please, please print my listing.*

*The computer will ask you a number. Do that and press Return. Then the computer will ask you another number. You cannot enter a number bigger than 6. Well, bye from one of your greatest readers.* – **R. Jugon, Wembley, Middlesex.**

```
   10 REM Lissajous Curves
   20 REM by Reza Jugon
   30 MODE 4
   40 INPUT "WHAT TWO NUMBE
RS",A,B
   50 CLS:T=0
   60 MOVE 1200,500
   70 X=600+600*COS(A*T)
   80 Y=500+500*SIN(B*T)
   90 DRAW X,Y
  100 T=T+.01
  110 GOTO70
```

## Bleep, bleep!

*WHEN this program is run it will enable the BBC to respond to a key being pressed with a bleep.*

```
   10 code%=&70
   20 P%=code%
   30 ?&0220=code% MOD 256
   40 ?&0221=code% DIV 256
   50 [
   60 LDA#&07
   70 JSR &FFEE
   80 RTS
   90 ]
0070
0070 A9 07    LDA#&07
0072 20 EE FF JSR &FFEE
0075 60       RTS
```

*To switch the bleep on and off use *FX 14,2 / *FX 13,2 respectively.*

*If you have version 1.0 OS then you will be able to vary the type of bleep you get using the following FX calls:*

**FX 211,X where X is the channel number.*

**FX 212,X where X is an envelope number (0-127 in steps of 4).*

**FX 213,X where X is the pitch (0-255).*

**FX 214,X where X is the duration (0-255).* – **Anwar Ali, Birmingham.**

## ¡Digamé por favor!

*SINCE your magazine seems to be the fount of all wisdom on matters Beeb, perhaps you can explain something for me.*

*I am trying to write programs to help my students revise their Spanish. In order to do this I include a procedure which defines the function keys f0 to f7 as the Spanish accented vowels, ñ, and upside down exclamation and question marks.*

*By using the VDU23 command the function keys produce the relevant letters etc. when the shift key is held down and Mode 6 is being used.*

*Now for the query. When I am keying in a program in Mode 7, the function keys, when pressed, naturally leave a blank on the screen, but any letters following my user defined f-keys appear in colour – red after é, green after í, yellow after ó, blue after ú, magenta after ñ and*

→

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# MICROMAIL

**From Page 205**

*cyan after the upside down question mark. Why?*

*But the mystery deepens (for me at any rate) when I run a program incorporating this procedure and then LIST it.*

*No matter whether in Mode 6 or Mode 7, the accented vowels show up in the DATA statements as follows (in the order a to u) AND, DIV, EOR, MOD, OR, while ñ prints as ERROR and the upside down question mark and exclamation mark show up as LINE and OFF respectively.*

*Despite this the READ statement usually reads them as Spanish accented vowels etc though not always.*

*Is there any explanation for this and is there any way round it, for example another way of defining the function keys to produce the results I want?*

*I enclose a copy of the procedure which I took from another less well-known magazine! –* **A.S. Dawson, Meols, Wirral.**

● The problem arises from the other magazine being, I suspect, inadvertently quoted out of context.

The user defined characters you quote, which we cannot print for copyright reasons, run from code 128 onwards.

Now the BBC Micro will accept a continuous block of 32 characters as user defined from wherever you care to start, without having to resort to esoteric exploding of the character set.

However, most of us use the already free characters from 224 to 255. This is what we would suggest you do, substituting in the VDU 23 statements 224 for 128, 225 for 129 and so on. (And, of course, in the lines where they are invoked.)

In Mode 7 there aren't any user defined characters. The codes from 128 on are deliberately used to change the colour and other attributes of characters on a line – hence your difficulties. See Nigel Peters' superb introduction to this in the August and September 1984 issues of *The Micro User*.

Your problems in the data statements belie a certain sophistication in your programming. You must have POKEd the values into the data statements using the indirection operators.

When the micro comes to read these bytes, it assumes that everything is still according to the rules of Basic and interprets the lines accordingly.

The numbers 128 and so on are already reserved by Basic as the codes, or tokens, for the words AND, DIV and so on. Hence the latter appear on your screen when the program is listed.

**And finally, with tongue firmly in cheek . . .**

# A red letter day for Wally

*Dear Trev,*

*I'm not sure if I should tell you this – I was sworn to secrecy on a copy of the User Guide – but I've just returned from a pilgrimage to the Micro User offices.*

*What happened was that I won the last competition. The first prize was "a day with the wacky, zany Micro User team".*

*Well, I say that I won it, but that's not really true. It was Andrea who cut out the coupon and sent it in using my name.*

*She won't tell me what her entry was and Micro User say they daren't publish it, but it won.*

*The first I knew about it all was when a shifty looking person sneaked up to our door and shoved a grubby handwritten note into my hand.*

*"That's been smuggled out of the Micro User offices", he whispered furtively. "Don't tell a soul".*

*Trembling with anticipation I opened it. "Dear Wally, Congrats you've won the prize. Report to the office on Monday and don't forget the coffee. – The Beeb team. P.S. Eat this note."*

*Well, I could hardly contain myself. I didn't eat the note – relics like that are too valuable. I still have it pressed in the pages of my Remedial Users Guide.*

*Anyway, I turned up at Micro User House and introduced myself to the receptionist.*

*"I'm sorry, they're not taking calls today", she told me, sympathetically.*

*"But I'm expected", I whimpered.*

*"Maybe that's why they're not taking calls", came the retort.*

*A lesser man might have been daunted, but I knew exactly the right psychological approach. I screamed and bawled, cried, yelled and eventually held my breath. And it worked.*

*"All right, you win. They're upstairs, second door on the right. The one marked 'Abandon hope all ye who enter here' ".*

*Shaking with excitement I mounted the stairs and there before me was the door of the Micro User offices. I knocked, reverently.*

*"Go away!"*

*I knocked again.*

*"We're not here".*

*"I'm the one who won the prize", I wailed.*

*The door was flung open.*

*"Why didn't you say so? Come in. Did you bring the coffee? Hey lads, it's Wally. Welcome to the Black Hole of Hazel Grove".*

*And with that I entered the inner sanctum of The Micro User.*

*I'm afraid I can't tell you much about the place itself. As I've said, I was sworn to secrecy. However, there are bits that I can reveal.*

*Imagine a small, airless room. In it toil three dedicated men, all with an attitude of quiet desperation. A tense silence prevails, broken only by cries of "Mode 7" as the Micro User team taunt the Editor of Electron User.*

*Too scared to break their concentration I stayed in the background, endlessly making cups of coffee. Suddenly the pressure eased.*

*"Lads, I've got the answer to five down. It's 'SYNTAX ERROR'. No wonder we couldn't get it!"*

*With groans of relief the team relaxed and put down their crosswords.*

*"Right then", cried the Editor, "they're not open, so we may as well work on the mag. Anyone know what a TAB statement is?"*

*Before I could reply the door burst open and in came a cross between the Ancient Mariner and Alice's rabbit.*

*"Lads, lads", he cried, "I've got a great idea. We'll get all sorts of utilities and games for the Beeb, add a few news stories and letters and things and issue it as a special. What about that then?"*

*The team looked at him in pity. The Editor got up, put an arm around his shoulders and took him out.*

*"Dick", he said gently, showing him the infinite patience of the truly great," we're already doing it. It's called The Micro User".*

*As he led him away I looked at the others for enlightenment.*

*"That's the Dungeon Master. He owns the place. Hasn't been the same since he tried to go solo on a QL. Damn bad show".*

*And that's really all I can tell you. I never met Alice. Apparently she was in one of the rooms but we never found the right one.*

*Be good,*

**Bob**

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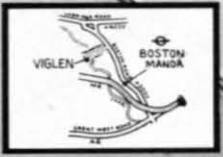

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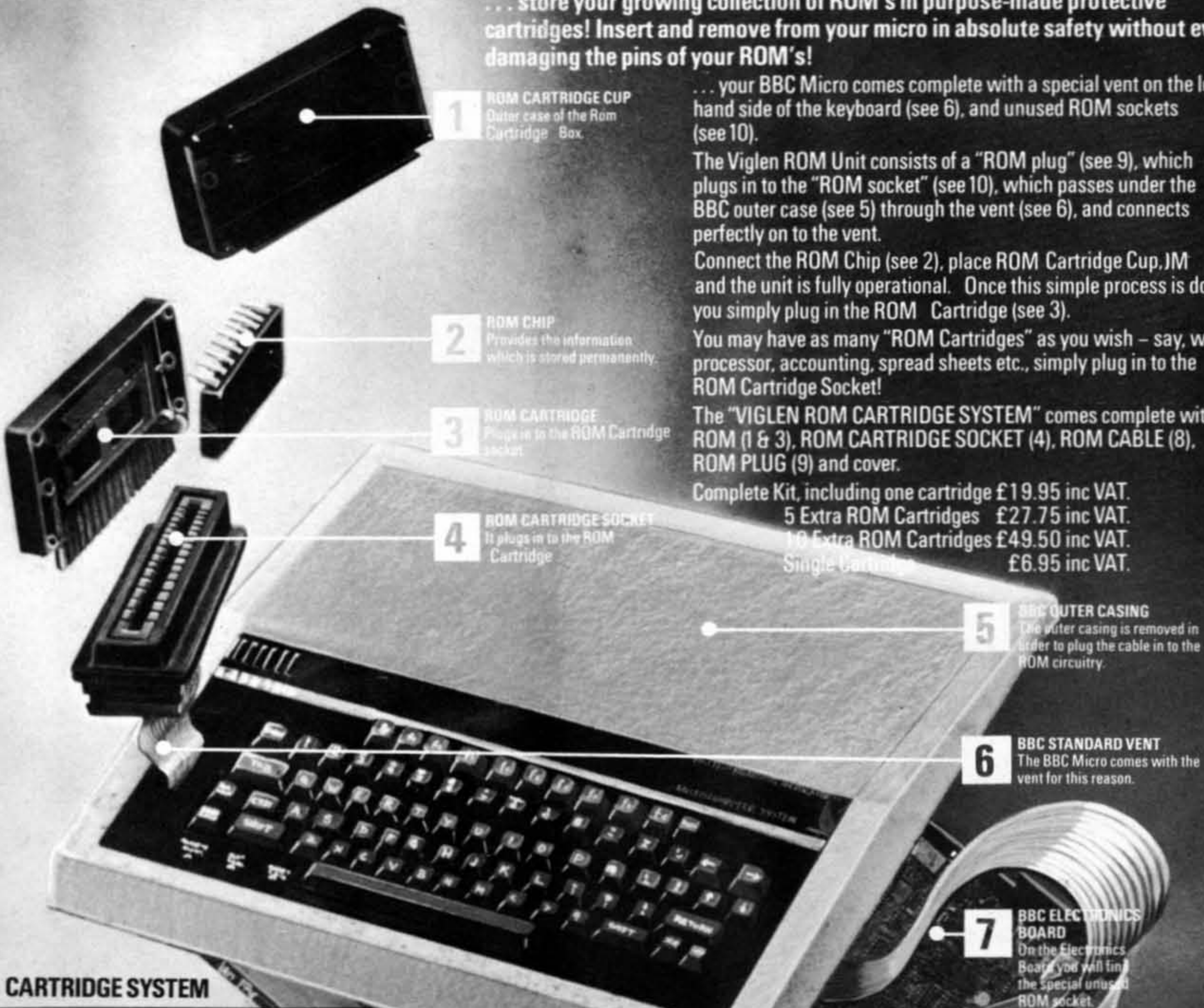
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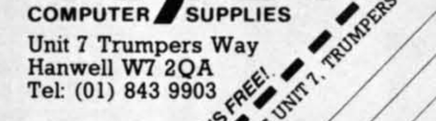

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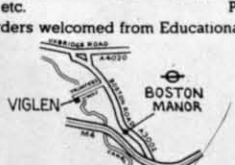

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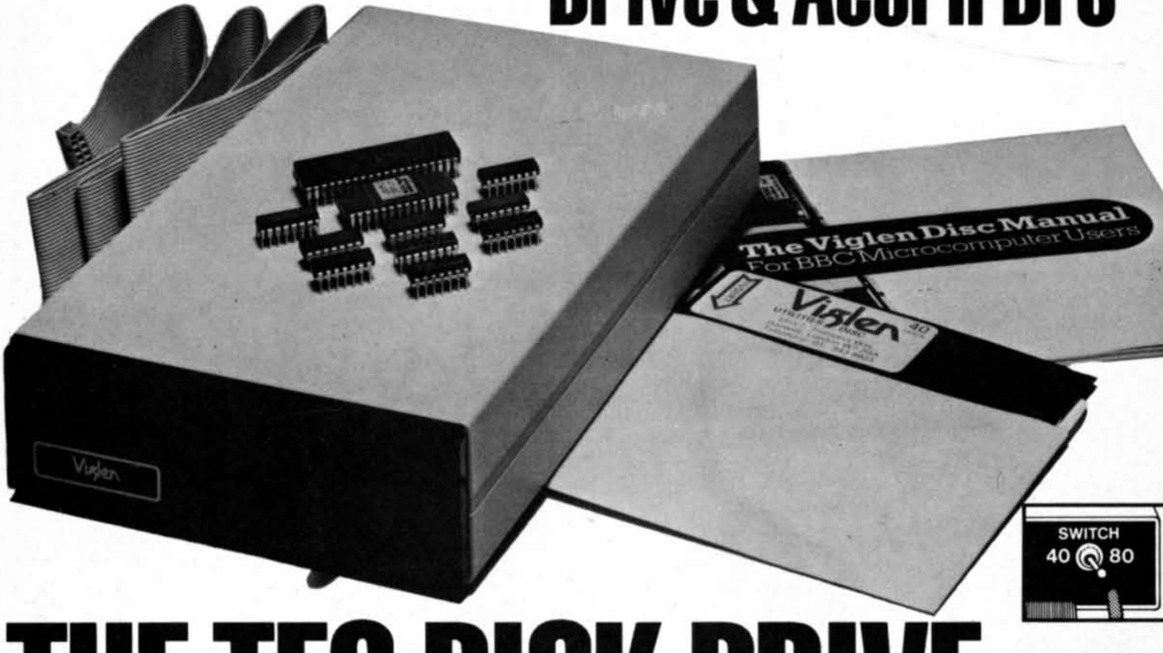

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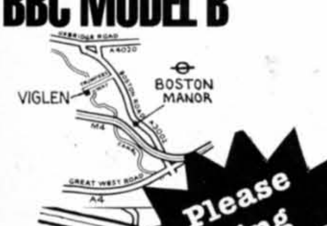

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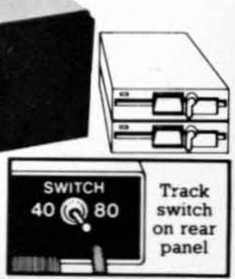

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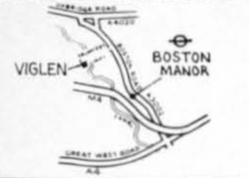

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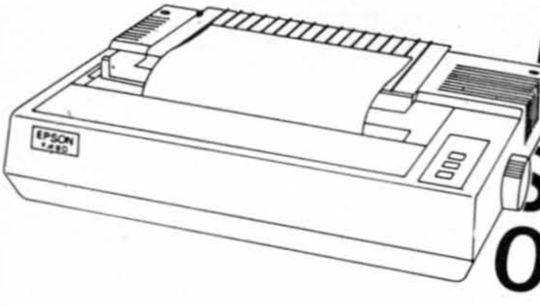

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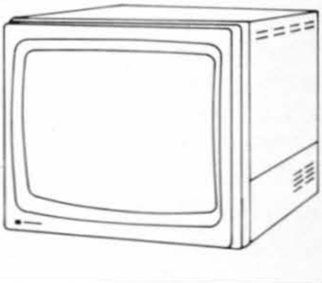

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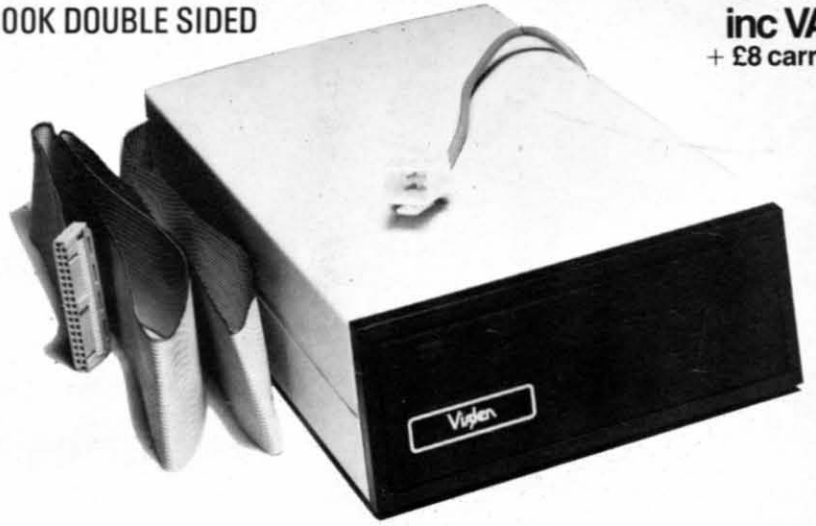

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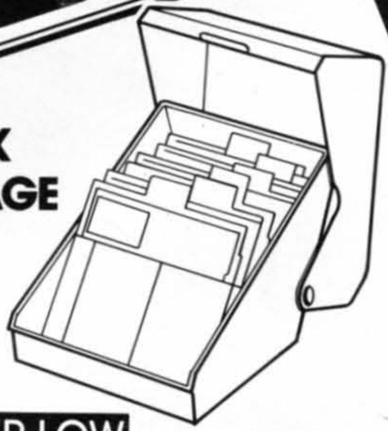

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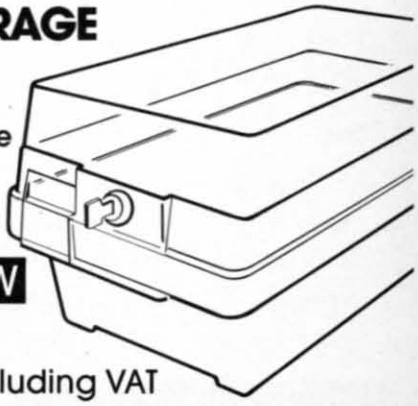

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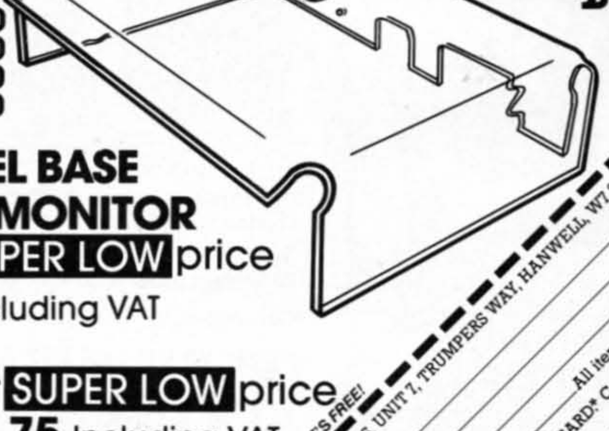

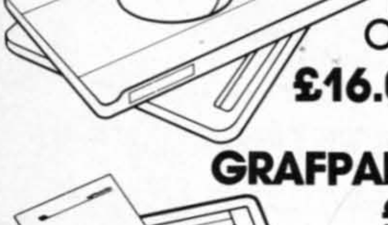

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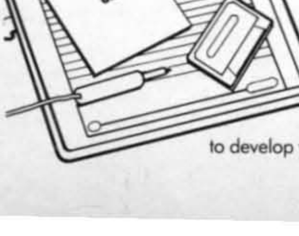

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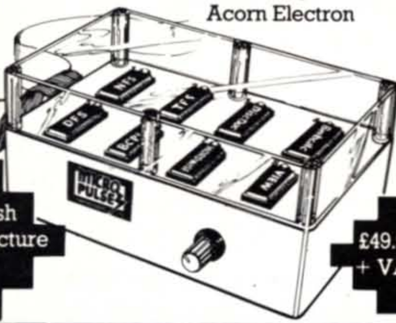

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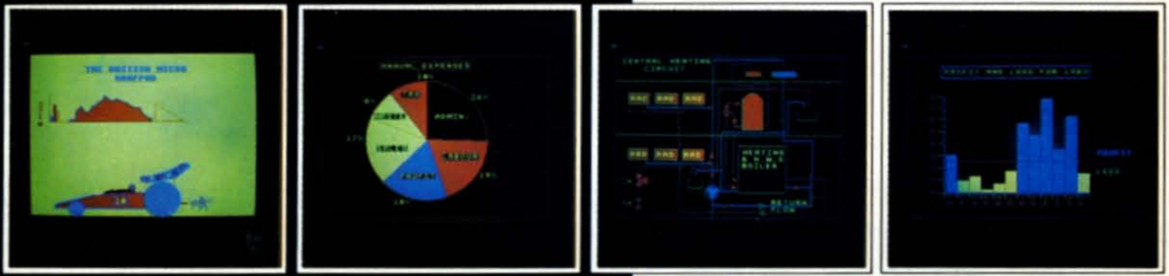

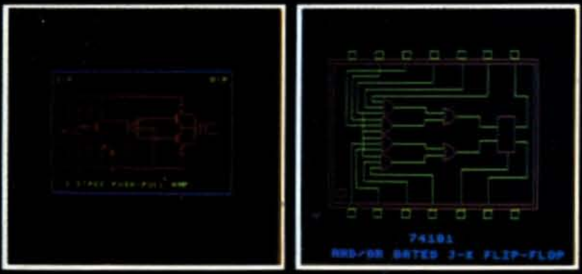

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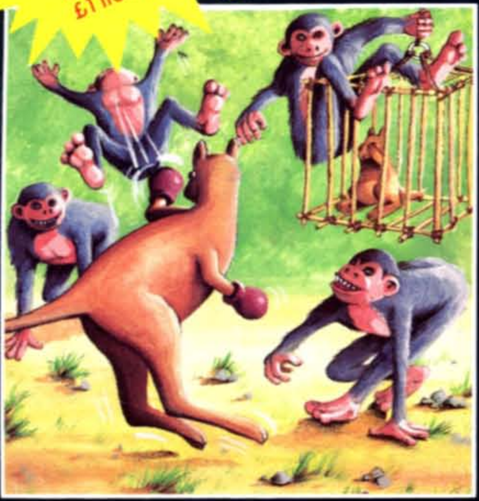

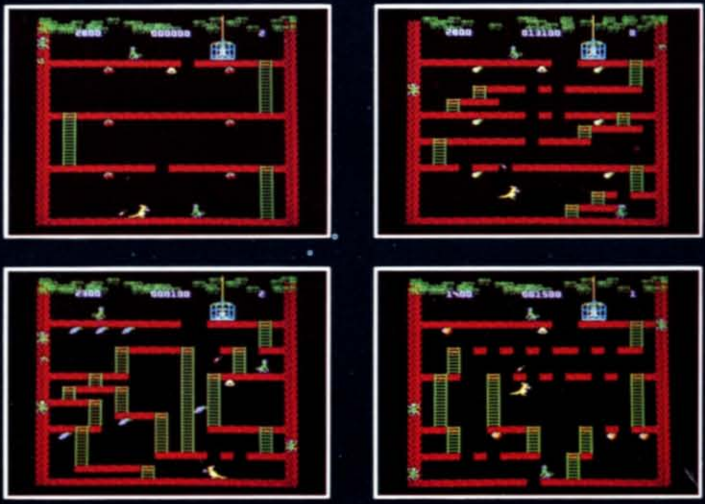

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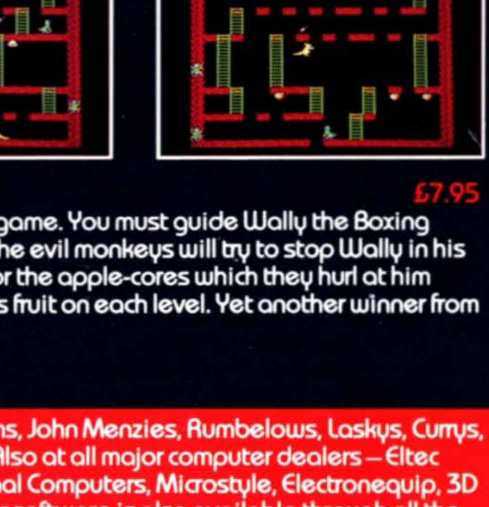

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